

STATE OF TEXAS
DEPARTMENT OF TRANSPORTATION

DESIGN SPEED = 20 mph
AASHTO - GUIDE FOR THE DEVELOPMENT
OF BICYCLE FACILITIES

TEXAS DEPARTMENT OF TRANSPORTATION © 2017			
FED. ROAD DIV. NO.	FEDERAL AID PROJECT NO.	SHEET NO.	
6	-	1	
STATE	STATE DISTRICT	COUNTY	
TEXAS	TYLER	GREGG	
CONT.	SECT.	JOB	HIGHWAY NUMBER
-	-	-	US HIGHWAY 80

INDEX OF SHEETS

SHEET NO.	DESCRIPTION
1	TITLE SHEET
2	SUPPLEMENTAL INDEX

PLANS OF PROPOSED
HIKE AND BIKE TRAIL

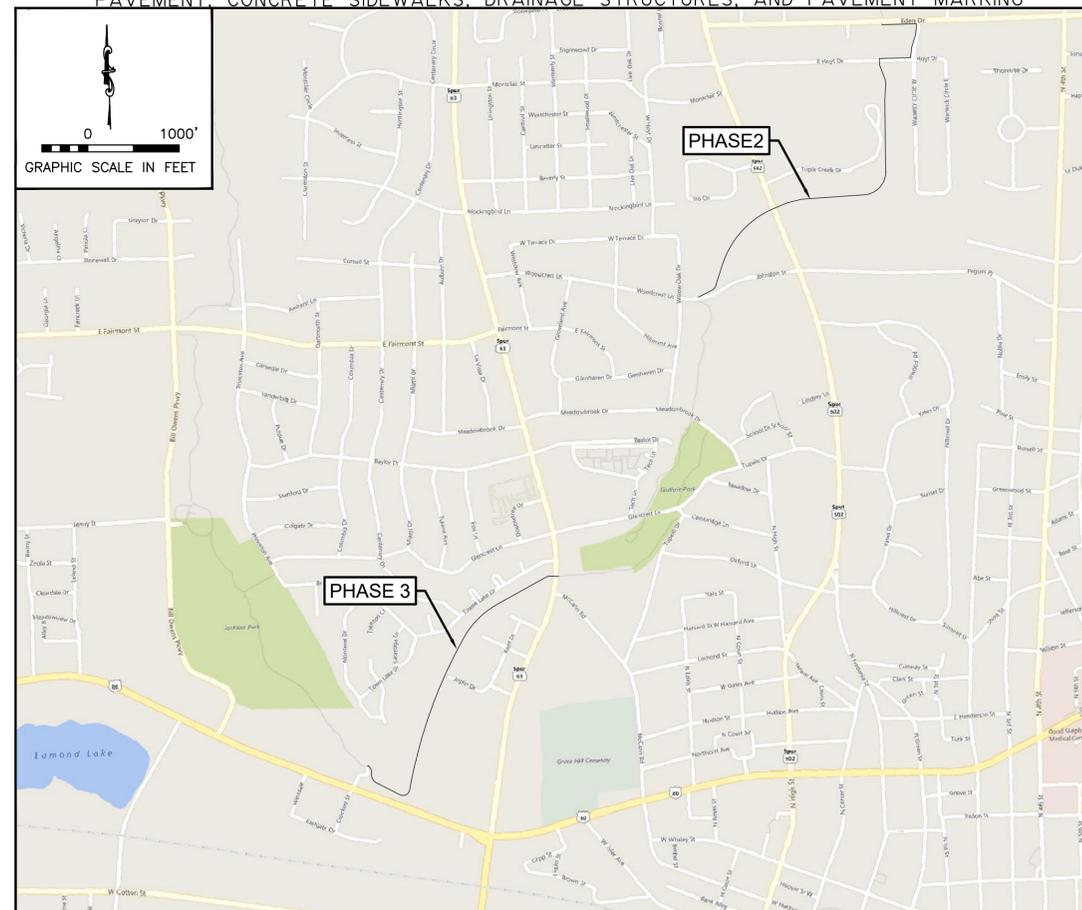
PROJECT STP 2002 (I92) TE

GREGG COUNTY
CONTROL SECTION JOB: 0910-07-050
FROM: U.S. 80 (MARSHALL AVE) N.
TO: FAIRMONT STREET

ROADWAY LENGTH ?? FT
SIDEWALK LENGTH 8,775 LF
BRIDGES LENGTH 240 FT
TOTAL LENGTH ?,?? LF

GREGG COUNTY
VA

PHASE 2 FROM JOHNSTON ST. NORTH TO SOUTH RIGHT OF WAY OF EDEN DR.
PHASE 3 FROM U.S. 80, W. OF SPUR 63 IN LONGVIEW, N. ALONG GUTHRIE CREEK TO E. OF SPUR 63. FOR THE CONSTRUCTION OF MISCELLANEOUS WORK CONSISTING OF CONCRETE PAVEMENT, CONCRETE SIDEWALKS, DRAINAGE STRUCTURES, AND PAVEMENT MARKING



TDLR INSPECTION REQUIRED

NOTES:
THE UNITED STATES ARMY CORPS OF ENGINEERS
NATIONWIDE PERMIT 42 APPLIES. HORIZONTAL CONTROL IS
BASED UPON NAD 83 TEXAS NORTH CENTRAL ZONE.
VERTICAL CONTROL IS BASED UPON NAVD 88. ALL BEARING
AND COORDINATES ARE BASED UPON THE TEXAS STATE
PLANE COORDINATES SYSTEM, (NAD 83) NORTH CENTRAL
ZONE.

SPECIFICATIONS ADOPTED BY THE TEXAS DEPARTMENT OF
TRANSPORTATION JUNE 1, 2004 AND SPECIFICATIONS ITEMS
LISTED AND DATED AS FOLLOWS, SHALL GOVERN ON THIS
PROJECT: REQUIRED CONTRACT PROVISIONS, FEDERAL - AID
CONSTRUCTION CONTRACTS (FORM FHWA 1273, DECEMBER
1993)

NO EXCEPTION
NO R.R. CROSSINGS ELIMINATED
LAYOUT SCALE: 1 IN. = 1,000 FT.

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THE STANDARD SHEETS INCLUDED IN THIS SET OF PLANS
HAVE BEEN ISSUED BY ME AND ARE APPLICABLE TO
THIS PROJECT.

_____, P.E.
JOHN C. RINGLER

FINAL PLANS

DATE CONTRACT LET:
DATE CONTRACTOR BEGAN WORK:
DATE WORK COMPLETED & ACCEPTED :
CONTRACTOR :
USED OF ALLOTTED DAYS
FINAL CONTRACT COST : \$

SIGNING IN ACCORDANCE WITH
STANDARD B.C. SHEETS AND
PART VI OF THE TEXAS
MANUAL ON UNIFORM TRAFFIC
CONTROL DEVICES

**THIS DOCUMENT IS
RELEASED FOR THE
PURPOSE OF INTERIM
REVIEW UNDER THE
AUTHORITY OF
JOHN C. RINGLER, P.E.
TX LC 82607
IT IS NOT INTENDED
FOR CONSTRUCTION,
BIDDING, OR
PERMIT PURPOSE
MARCH 21, 2017**

PREPARED BY : _____ 20

CONCURRENCE: _____ 20

JOHN C. RINGLER P.E.
KSA INC.

ROLIN McPHEE, PUBLIC WORKS
CITY OF LONGVIEW

TEXAS DEPARTMENT OF TRANSPORTATION

SUBMITTED _____ 20
FOR LETTING:

APPROVED FOR LETTING: _____

DESIGN ENGINEER

DIRECTOR, DESIGN DIVISION

RECOMMENDED _____ 20
FOR LETTING:

APPROVED FOR LETTING: _____

DISTRICT ENGINEER

DIRECTOR, TRAFFIC OPERATIONS DIV.

COUNTY _____ GREGG PROJ. NO. _____ 0910_07_50
HWY. NO. _____ LETTING DATE _____
DATE ACCEPTED _____

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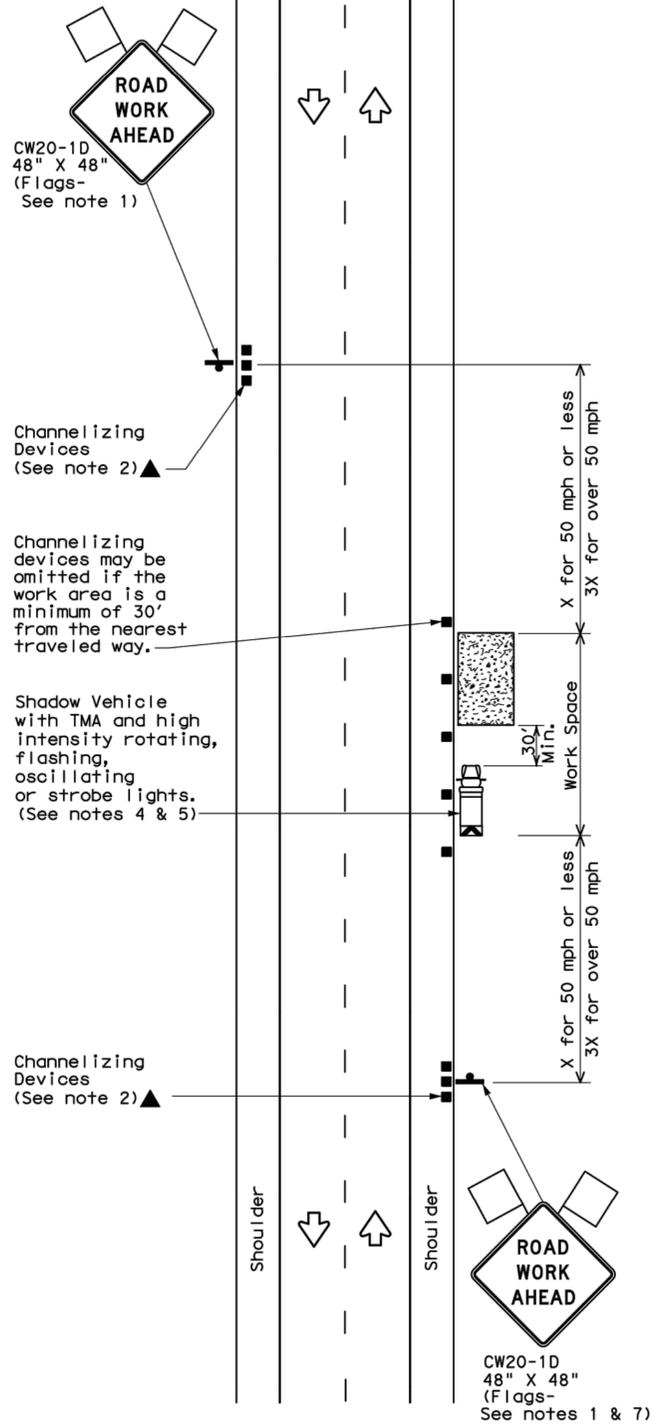
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	Design Division (Pavement)																																								
 <p>140 E. Tyler Street, Suite 600 Longview, Texas 75601 T. 903-236-7700 F. 903-236-7779 www.ksaeng.com</p>	THIS DOCUMENT IS RELEASED FOR THE PURPOSE OF INTERIM REVIEW UNDER THE AUTHORITY OF JOHN C. RINGLER, P.E. TX LC 82607 IT IS NOT INTENDED FOR CONSTRUCTION, BIDDING, OR PERMIT PURPOSE MARCH 21, 2017																																								
<p>SEAL: TBPE Firm Registration No. F-1356</p>																																									
<p>CITY OF LONGVIEW, TEXAS GUTHRIE CREEK TRAIL PHASE 2 AND 3 SUPPLEMENTAL INDEX</p>																																									
<p>SHEET 1 OF 1 SHEETS</p>																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>FILE: LV354 - C - GI - 0002.DWG</td> <td>DN: -</td> <td>CK: -</td> <td>DW: -</td> <td>CK: -</td> <td>STD: -</td> </tr> <tr> <td>©TXDOT</td> <td>April 17</td> <td>DIST</td> <td>FED REG</td> <td>FEDERAL AID PROJECT</td> <td>* SHEET</td> </tr> <tr> <td colspan="2">REVISIONS</td> <td>TYLER</td> <td>6</td> <td></td> <td>2</td> </tr> <tr> <td colspan="2"></td> <td>COUNTY</td> <td>CONTROL</td> <td>SECT</td> <td>JOB</td> </tr> <tr> <td colspan="2"></td> <td>GREGG</td> <td></td> <td></td> <td></td> </tr> </table>	FILE: LV354 - C - GI - 0002.DWG	DN: -	CK: -	DW: -	CK: -	STD: -	©TXDOT	April 17	DIST	FED REG	FEDERAL AID PROJECT	* SHEET	REVISIONS		TYLER	6		2			COUNTY	CONTROL	SECT	JOB			GREGG				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>										
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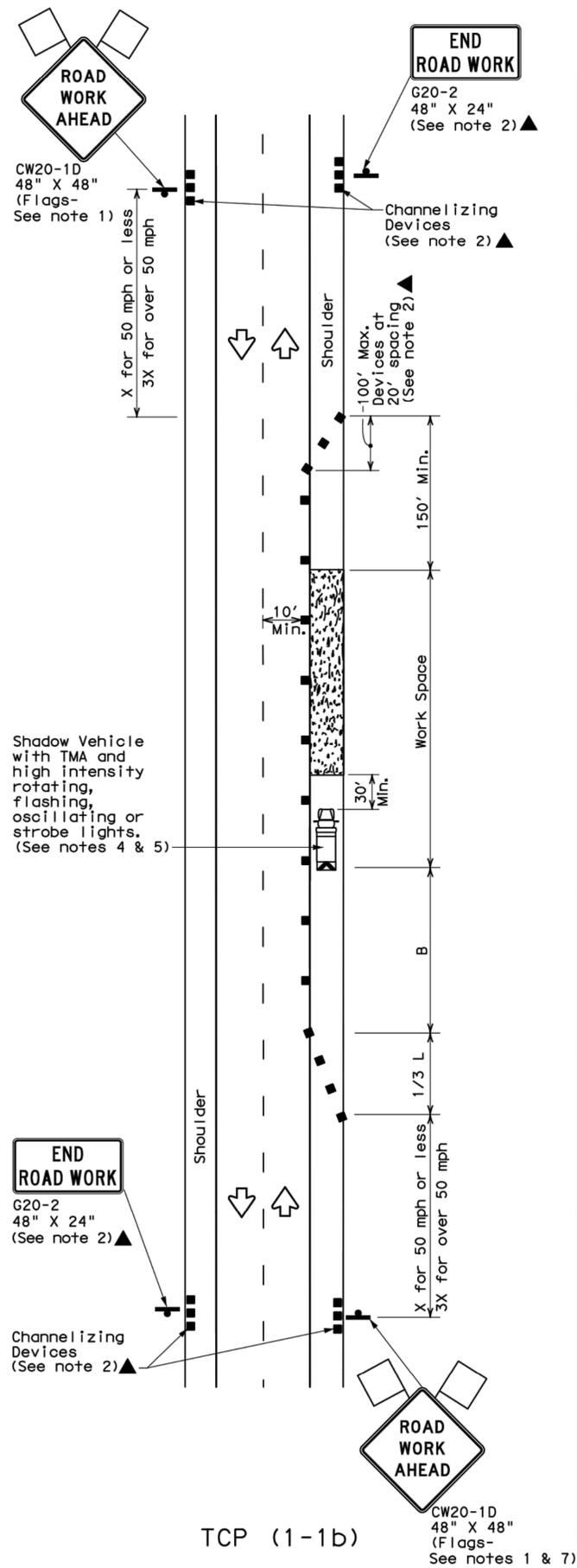
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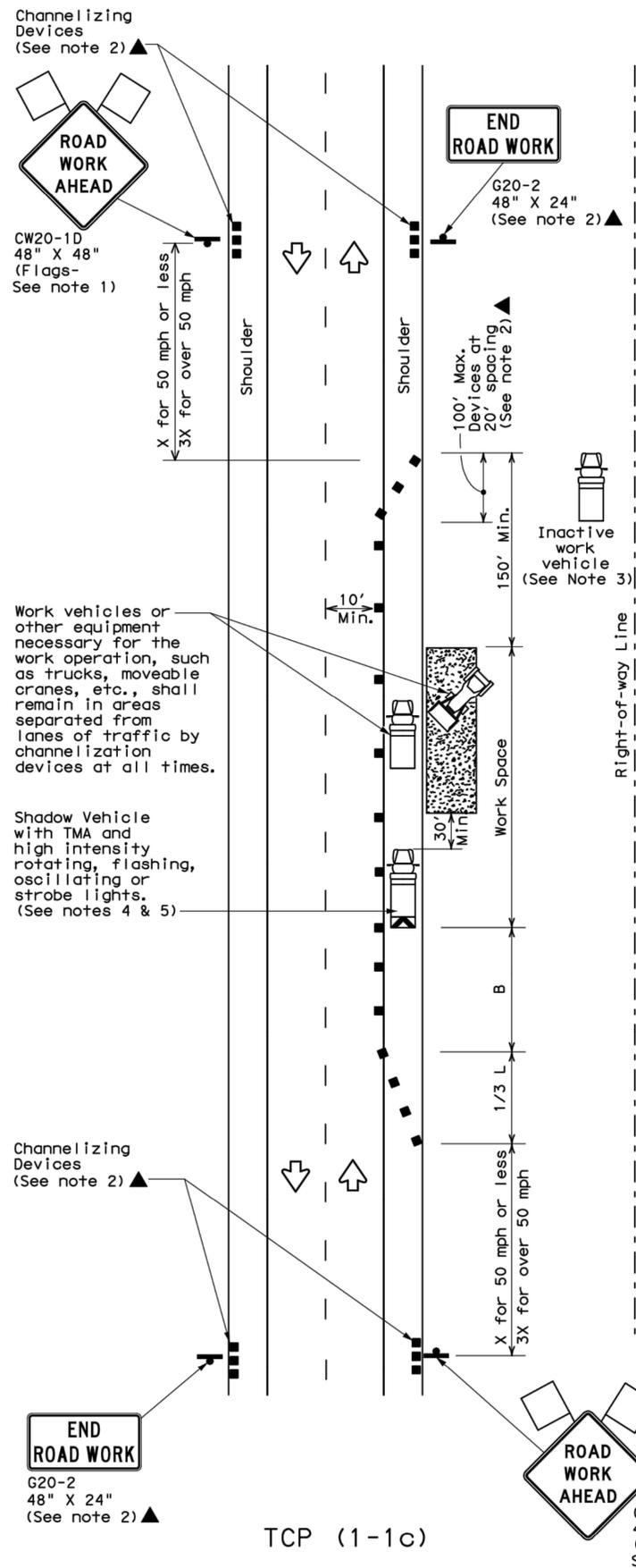
TCP (1-1a)

WORK SPACE NEAR SHOULDER
Conventional Roads



TCP (1-1b)

WORK SPACE ON SHOULDER
Conventional Roads



TCP (1-1c)

WORK VEHICLES ON SHOULDER
Conventional Roads

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator (TMA)
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	Flag		Flagger

Posted Speed * S	Formula L = WS / 60	Minimum Desirable Taper Lengths ** X			Suggested Maximum Spacing of Channelizing Devices		Minimum Sign Spacing "X" Distance	Suggested Longitudinal Buffer Space "B"
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent		
30		150'	165'	180'	30'	60'	120'	90'
35		205'	225'	245'	35'	70'	160'	120'
40		265'	295'	320'	40'	80'	240'	155'
45		450'	495'	540'	45'	90'	320'	195'
50		500'	550'	600'	50'	100'	400'	240'
55		550'	605'	660'	55'	110'	500'	295'
60		600'	660'	720'	60'	120'	600'	350'
65		650'	715'	780'	65'	130'	700'	410'
70		700'	770'	840'	70'	140'	800'	475'
75		750'	825'	900'	75'	150'	900'	540'

* Conventional Roads Only

** Taper lengths have been rounded off.

L=Length of Taper (FT) W=Width of Offset (FT) S=Posted Speed (MPH)

TYPICAL USAGE				
MOBILE	SHORT DURATION	SHORT TERM STATIONARY	INTERMEDIATE TERM STATIONARY	LONG TERM STATIONARY
	✓	✓		

GENERAL NOTES

- Flags attached to signs where shown are REQUIRED.
- All traffic control devices illustrated are REQUIRED, except those denoted with the triangle symbol may be omitted when stated elsewhere in the plans, or for routine maintenance work, when approved by the Engineer.
- Inactive work vehicles or other equipment should be parked near the right-of-way line and not parked on the paved shoulder.
- A Shadow Vehicle with a TMA should be used anytime it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the performance or quality of the work. If workers are no longer present but road or work conditions require the traffic control to remain in place, Type 3 Barricades or other channelizing devices may be substituted for the Shadow Vehicle and TMA.
- Additional Shadow Vehicles with TMAs may be positioned off the paved surface, next to those shown in order to protect wider work spaces.
- See TCP(5-1) for shoulder work on divided highways, expressways and freeways.
- CW21-5 "SHOULDER WORK" signs may be used in place of CW20 "ROAD WORK AHEAD" signs for shoulder work on conventional roadways.

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For construction or maintenance contract work, project requirements for shadow vehicles can be in the project GENERAL NOTES for Item 502, Barricades, Signs and Traffic Handling.

Texas Department of Transportation
Traffic Operations Division

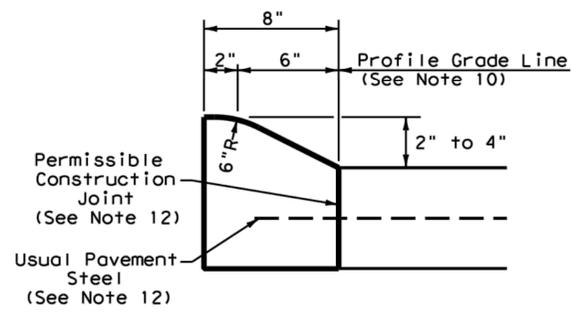
TRAFFIC CONTROL PLAN
CONVENTIONAL ROAD
SHOULDER WORK

TCP (1-1) -12

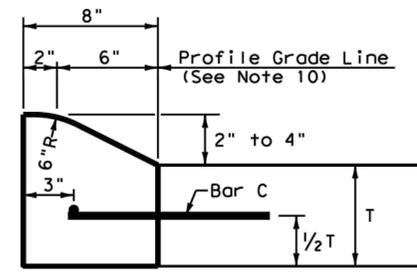
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REVISONS		CONT	SECT	JOB	HIGHWAY
2-94	8-95	DIST		COUNTY	SHEET NO.
1-97	4-98				

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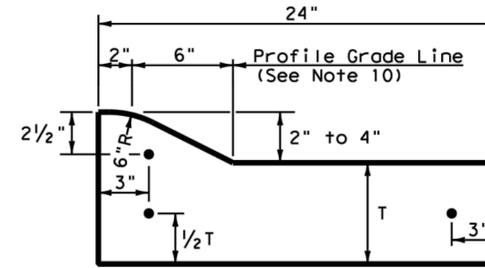
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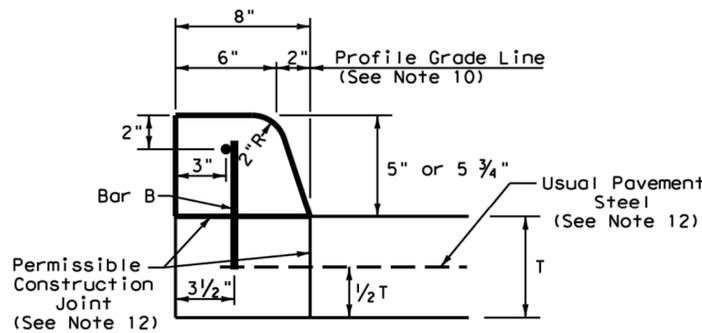
**TYPE I CURB (MONOLITHIC)
2" - 4" HEIGHT**



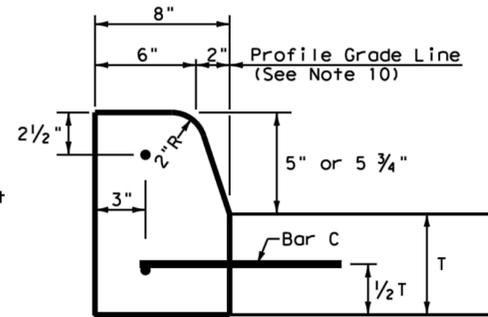
**TYPE I CURB
2" - 4" HEIGHT**



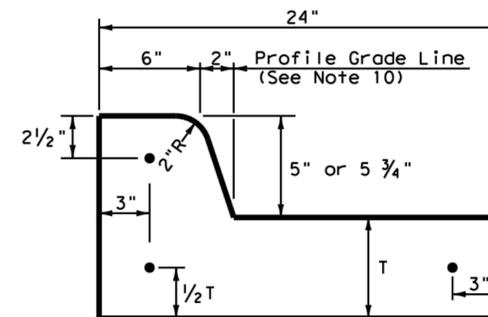
**TYPE I CURB AND GUTTER
2" - 4" HEIGHT**



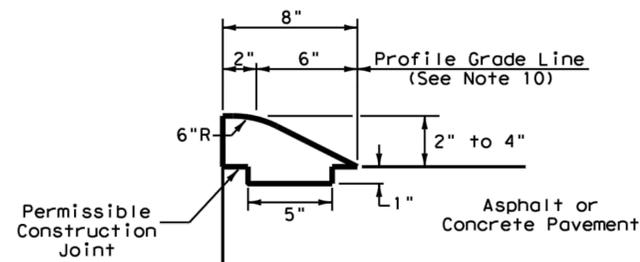
**TYPE II CURB (MONOLITHIC)
5" - 5 3/4" HEIGHT**



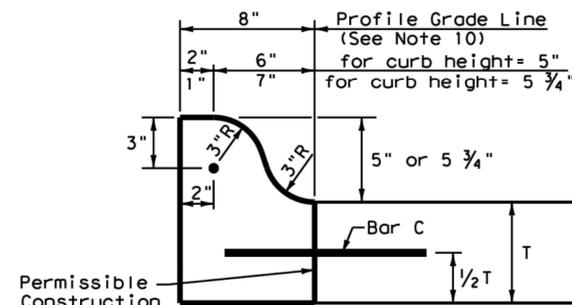
**TYPE II CURB
5" - 5 3/4" HEIGHT**



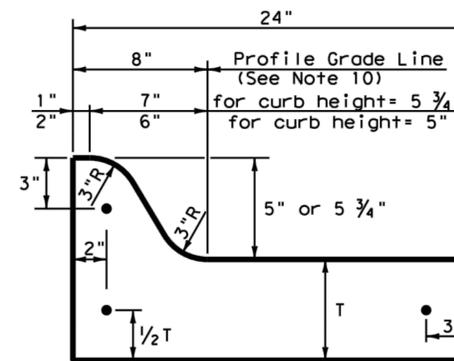
**TYPE II CURB AND GUTTER
5" - 5 3/4" HEIGHT**



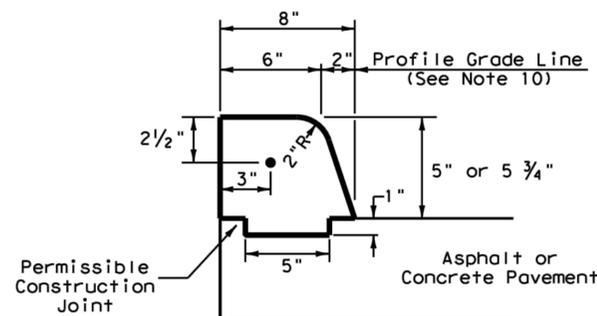
**TYPE III CURB (KEYED)
2" - 4" HEIGHT**



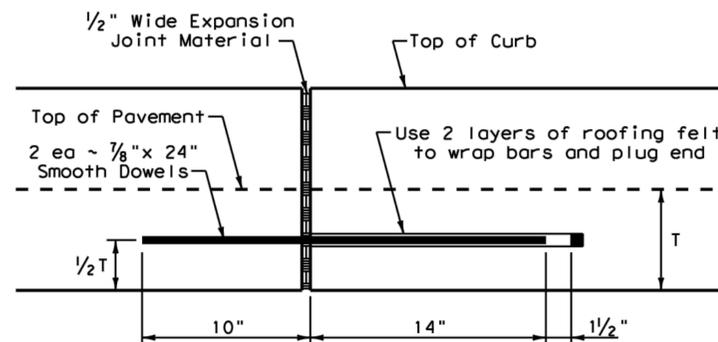
**TYPE IIa CURB
5" - 5 3/4" HEIGHT**



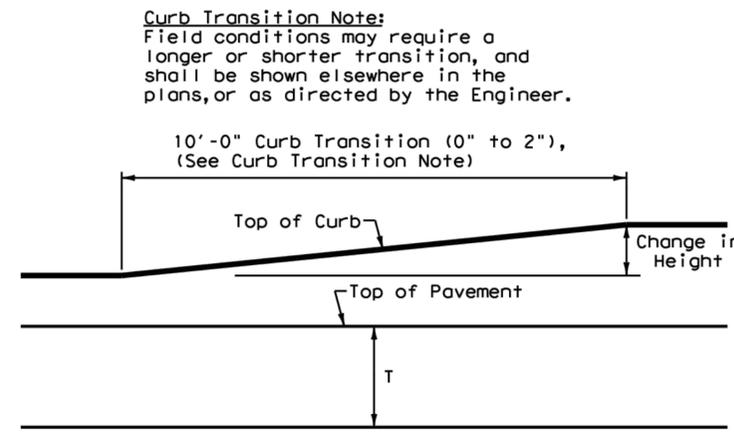
**TYPE IIa CURB AND GUTTER
5" - 5 3/4" HEIGHT**



**TYPE IV CURB (KEYED)
5" - 5 3/4" HEIGHT**



EXPANSION JOINT DETAIL

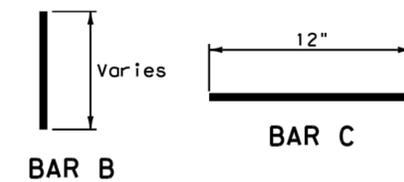


CURB TRANSITION

Note: To be paid for as Highest Curb

General Notes

- All materials and construction shall be in accordance with Item 529, "Concrete Curb, Gutter, and Combined Curb and Gutter."
- Concrete shall be Class A.
- When reinforcing bars are used, they shall be No.4 unless otherwise shown. The use of synthetic fiber in lieu of steel reinforcing is acceptable, provided the fiber producer is on the Department Producer List (MPL), maintained by TxDOT, Construction Division.
- Round exposed sharp edges with a rounding tool, to a minimum radius of 1/4 inch.
- All existing curbs and driveways to be removed shall be sawed or removed at existing joints.
- Where concrete curb is placed on existing concrete pavement, the pavement shall be drilled and the reinforcing bars grouted in place.
- Expansion and contraction joints shall be constructed to match pavement joints in all curbs and curb and gutter adjacent to jointed concrete pavement. Where placement of curb or curb and gutter is not adjacent to concrete pavement, expansion joints shall be provided at structures, curb returns at streets, and at locations directed by The Engineer.
- Vertical and horizontal dowel bars and transverse reinforcing bars shall be placed at four feet C-C.
- Dimension 'T' shown is the thickness of concrete pavement. When curb is installed adjacent to flexible pavement dimension 'T' is 8" maximum.
- Usual profile grade line. Refer to typical sections and plan-profile sheets for exact locations.
- One-half inch expansion joint material shall be provided where curb or curb and gutter is adjacent to sidewalk or riprap.
- When vertical permissible construction joints are used, resulting in a longitudinal construction joint in the pavement, the longitudinal pavement steel shall be placed in accordance with pavement details shown elsewhere in the plans for longitudinal construction joints. Reinforcing steel for curb section shall then conform to that required for concrete curb.

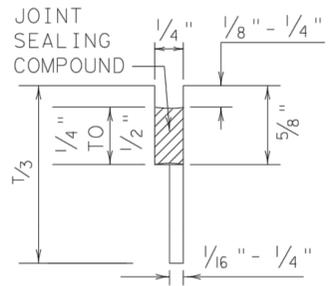


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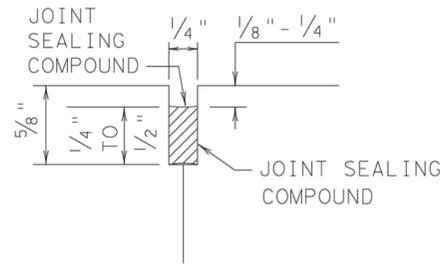
		<i>Design Division Standard</i>	
CONCRETE CURB AND CURB AND GUTTER			
CCCG-12			
FILE: cccg12.dgn	DN: TxDOT	CK: AM	DW: VP
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REVISIONS		HIGHWAY	
UPDATED 2012 - VP		DIST	SHEET NO.

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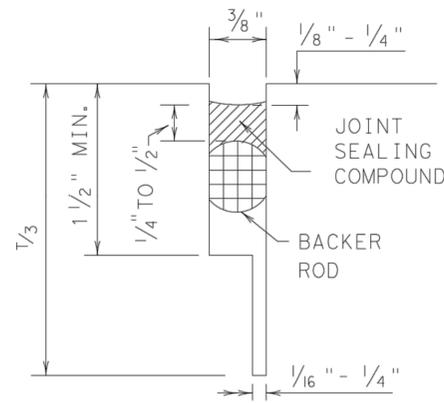
METHOD B: JOINT SEALING COMPOUND



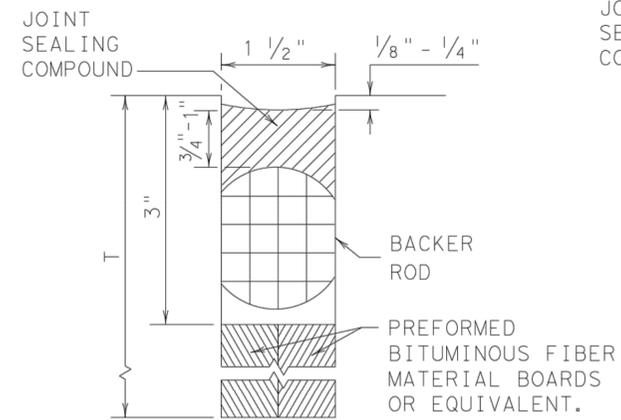
LONGITUDINAL SAWED CONTRACTION JOINT



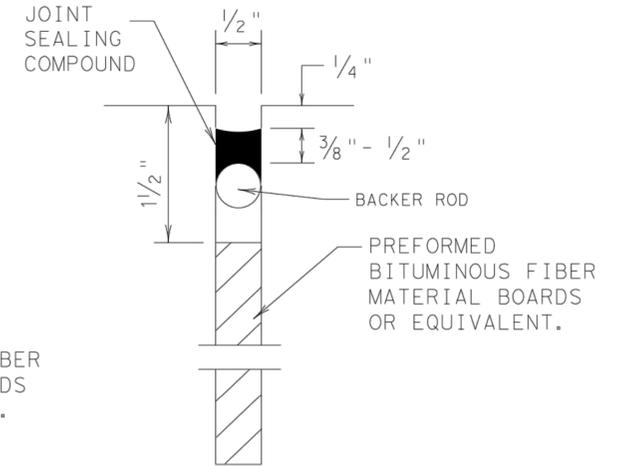
LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT

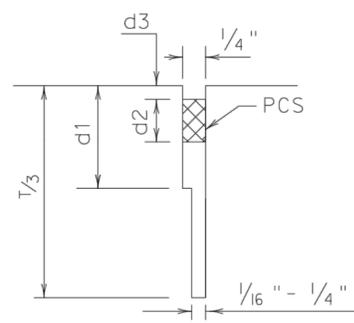


TRANSVERSE FORMED EXPANSION JOINT

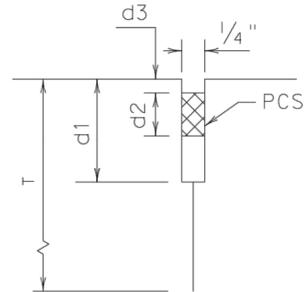


FORMED ISOLATION JOINT

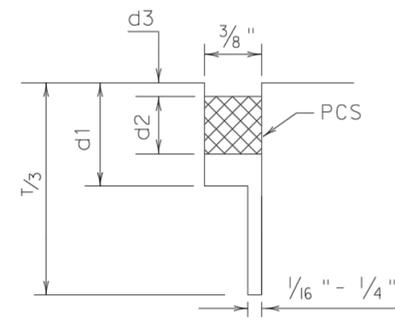
METHOD A: PREFORMED COMPRESSION SEALS (PCS) (DMS-6310 CLASS 6)



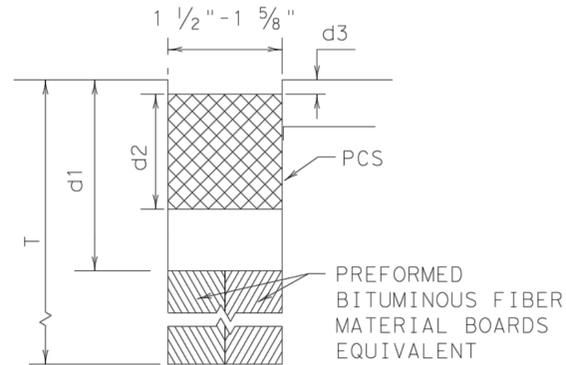
LONGITUDINAL SAWED CONTRACTION JOINT



LONGITUDINAL CONSTRUCTION JOINT



TRANSVERSE SAWED CONTRACTION JOINT



TRANSVERSE FORMED EXPANSION JOINT

GENERAL NOTES

- UNLESS OTHERWISE SHOWN IN THE PLANS, EITHER METHOD "A" OR METHOD "B" MAY BE USED.
- THE LOCATION OF JOINTS SHALL BE AS SHOWN ELSEWHERE IN THE PLANS.
- THE JOINT RESERVOIR FOR SEALANT OR PCS SHALL BE SAWED UNLESS OTHERWISE SHOWN ON THE PLANS FOR THE LONGITUDINAL AND TRANSVERSE CONSTRUCTION JOINTS AND THE SAWED JOINTS.
- DIMENSIONS d1, d2, AND d3 SHOWN IN METHOD A SHALL BE IN ACCORDANCE WITH THE PREFORMED COMPRESSION SEAL MANUFACTURER'S RECOMMENDATION.
- REFER TO DMS-6310 "JOINT SEALANTS AND FILLERS" FOR THE CLASSIFICATIONS.
- FOR SAWED LONGITUDINAL JOINT, LONGITUDINAL OR TRANSVERSE CONSTRUCTION JOINT, USE JOINT SEALANT CLASS 5 OR 8 UNLESS OTHERWISE SHOWN ON THE PLAN OR APPROVED.
- FOR TRANSVERSE SAWED CONTRACTION, TRANSVERSE FORMED EXPANSION JOINT, AND ISOLATION JOINT USE JOINT SEALANT CLASS 5 OR 8 AT NEW JOINTS. USE JOINT SEALANT CLASS 4,5,7,OR 8 FOR MAINTAINING EXISTING JOINTS.
- THE JOINTS SHALL BE CLEANED IN ACCORDANCE WITH THE ITEM 438 "CLEANING AND SEALING JOINTS AND CRACKS (CONCRETE PAVEMENT)".
- ISOLATION JOINTS ACCOMMODATE HORIZONTAL AND VERTICAL MOVEMENTS THAT OCCUR BETWEEN A JOINT AND A STRUCTURE. ISOLATION JOINTS MAY BE USED FOR BRIDGE ABUTMENTS, INTERSECTIONS, GUTTER, OLD AND NEW PAVEMENTS, OR AROUND DRAINAGE INLETS, MANHOLES, FOOTINGS AND LARGER STRUCTURES.

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		Design Division Standard	
CONCRETE PAVING DETAILS JOINT SEALS JS-14			
FILE: js14.dgn	DN: TxDOT	DN: HC	CK: AN
© TxDOT: DECEMBER 2014	CONT	SECT	HIGHWAY
REVISIONS	DIST	COUNTY	SHEET NO.

DATE: FILE:

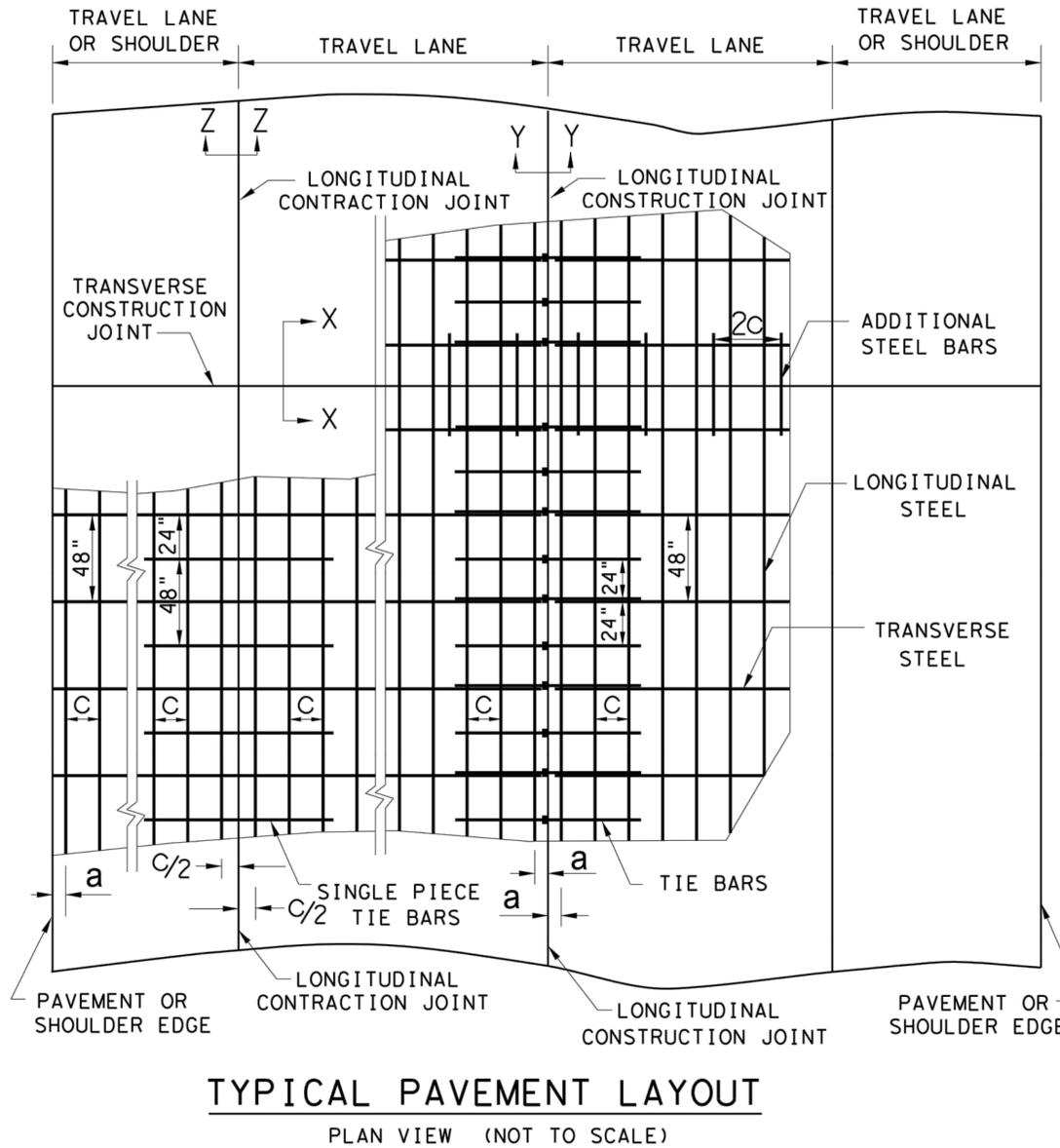
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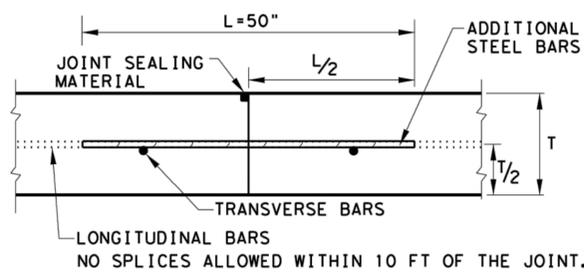
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TABLE NO. 1 LONGITUDINAL STEEL					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING c (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
7.0	#5	6.5	3 TO 4	13	50
7.5	#5	6.0	3 TO 4	12	50
8.0	#6	9.0	3 TO 4	18	50
8.5	#6	8.5	3 TO 4	17	50
9.0	#6	8.0	3 TO 4	16	50
9.5	#6	7.5	3 TO 4	15	50
10.0	#6	7.0	3 TO 4	14	50
10.5	#6	6.75	3 TO 4	13.5	50
11.0	#6	6.5	3 TO 4	13	50
11.5	#6	6.25	3 TO 4	12.5	50
12.0	#6	6.0	3 TO 4	12	50
12.5	#6	5.75	3 TO 4	11.5	50
13.0	#6	5.5	3 TO 4	11	50

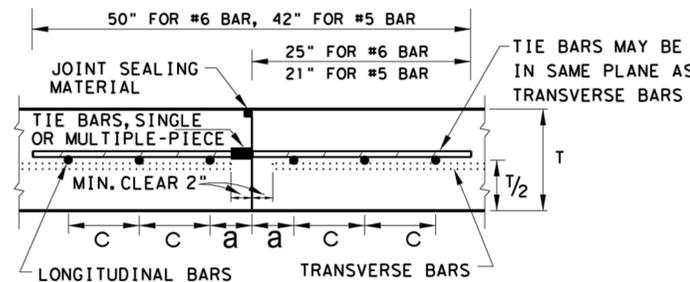
TABLE NO. 2 TRANSVERSE STEEL AND TIE BARS						
SLAB THICKNESS (IN.)	TRANSVERSE STEEL		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Z-Z)		TIE BARS AT LONGITUDINAL CONSTRUCTION JOINT (SECTION Y-Y)	
	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)	BAR SIZE	SPACING (IN.)
7.0 - 7.5	#5	48	#5	48	#5	24
8.0 - 13.0	#5	48	#6	48	#6	24



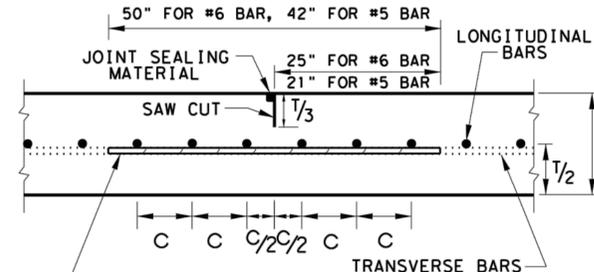
- DETAILS FOR PAVEMENT WIDTH, PAVEMENT THICKNESS AND THE CROWN CROSS-SLOPE SHALL BE SHOWN ELSEWHERE IN THE PLANS. PAVEMENTS WIDER THAN 100 FT. WITHOUT A FREE LONGITUDINAL JOINT ARE NOT COVERED BY THIS STANDARD.
- USE COARSE AGGREGATES TO PRODUCE CONCRETE WITH A COEFFICIENT OF THERMAL EXPANSION (CTE) NOT MORE THAN 5.5×10^{-6} IN/IN/°F.
- ALL THE REINFORCING STEEL AND TIE BARS SHALL BE DEFORMED STEEL BARS CONFORMING TO ASTM A 615 (GRADE 60) OR ASTM A 996 (GRADE 60) OR ABOVE. STEEL BAR SIZES AND SPACINGS SHALL CONFORM TO TABLE NO. 1 AND TABLE NO. 2.
- WHEN LOW CTE CONCRETE (NOT MORE THAN 4.0×10^{-6} IN/IN/°F) IS PRODUCED. TABLE NO. 1A MAY BE USED FOR LONGITUDINAL STEEL AS APPROVED BY THE ENGINEER.
- STEEL BAR PLACEMENT TOLERANCE SHALL BE ± 1 IN. HORIZONTALLY AND ± 0.5 IN. VERTICALLY. CALCULATED AVERAGE BAR SPACING (CONCRETE PLACEMENT WIDTH / NUMBER OF LONGITUDINAL BARS) SHALL CONFORM TO TABLE NO. 1 OR TABLE NO. 1A.
- PAVEMENT WIDTHS OF MORE THAN 15 FT. SHALL HAVE A LONGITUDINAL JOINT (SECTION Z-Z OR SECTION Y-Y). THESE JOINTS SHALL BE LOCATED WITHIN 6 IN. OF THE LANE LINE UNLESS THE JOINT LOCATION IS SHOWN ELSEWHERE ON THE PLANS.
- THE SAW CUT DEPTH FOR THE LONGITUDINAL CONTRACTION JOINT (SECTION Z-Z) SHALL BE ONE THIRD OF THE SLAB THICKNESS (T/3).
- WHEN TYING CONCRETE GUTTER AT A LONGITUDINAL JOINT, THE TIE BAR LENGTH OR POSITION MAY BE ADJUSTED. PROVIDE 3 IN. OF CONCRETE COVER FROM THE BACK OF GUTTER TO THE END OF TIE BAR.
- REPLACE MISSING OR DAMAGED TIE BARS WITHOUT ADDITIONAL COMPENSATION BY DRILLING MIN. 10 IN. DEEP AND GROUTING TIE BARS WITH TYPE III, CLASS C EPOXY. MEET THE PULL-OUT TEST REQUIREMENTS IN ITEM 361.
- OMIT TIE BARS LOCATED WITHIN 18 IN. OF THE TRANSVERSE CONSTRUCTION JOINTS (SECTION X-X). USE HAND-OPERATED IMMERSION VIBRATORS TO CONSOLIDATE THE CONCRETE ADJACENT TO ALL FORMED JOINTS.
- LONGITUDINAL REINFORCING STEEL SPLICES SHALL BE A MINIMUM OF 25 IN. STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT.
- THE DETAIL FOR THE JOINT SEALANT AND RESERVOIR IS SHOWN ON STANDARD SHEET "CONCRETE PAVING DETAILS, JOINT SEALS."



TRANSVERSE CONSTRUCTION JOINT
SECTION X - X



LONGITUDINAL CONSTRUCTION JOINT
SECTION Y - Y



LONGITUDINAL CONTRACTION JOINT
SECTION Z - Z

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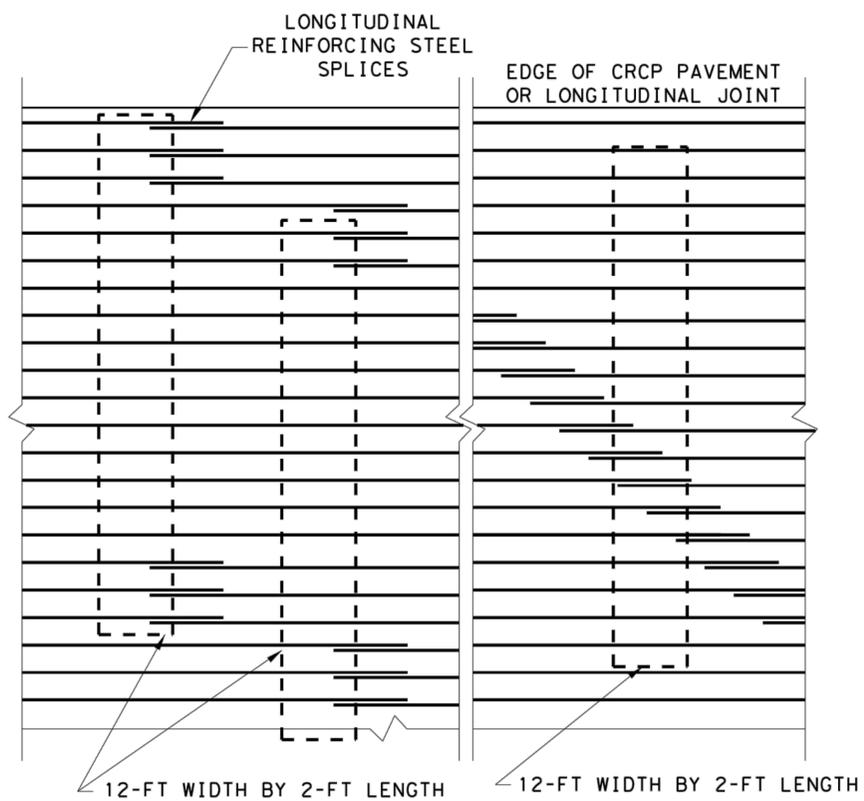
SHEET 1 OF 2

		Design Division Standard	
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT			
ONE LAYER STEEL BAR PLACEMENT			
T - 7 to 13 INCHES			
CRCP (1) - 13			
FILE: crcp113.dgn	DN: TxDOT	CK: AN	DW: HC
© TxDOT October 2013	CONT	SECT	JOB
REVISIONS			
10/10/2011 ADD GN #12			
04/09/2013 REMOVE 6" AND 6.5"			
ADD CTE REQUIREMENTS			
DIST	COUNTY	SHEET NO.	

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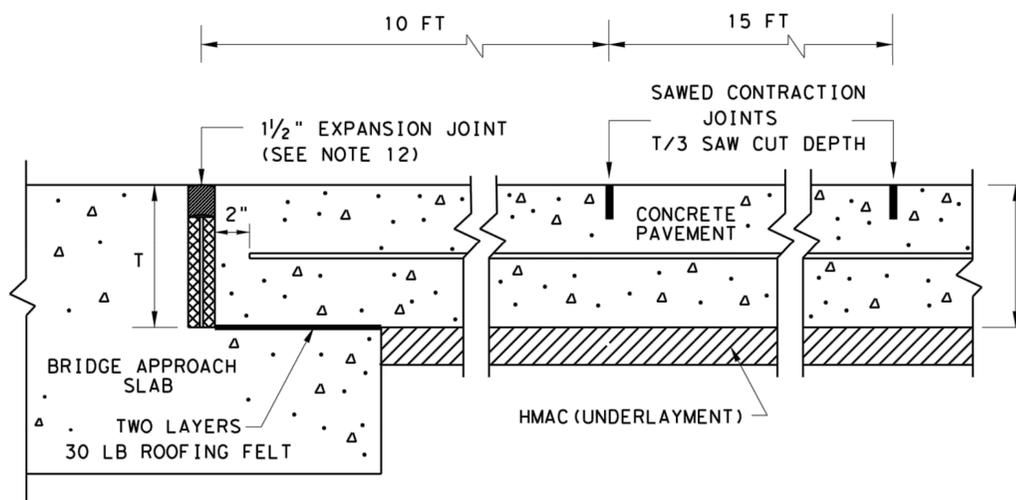
DATE: FILE:

TABLE NO.1A LONGITUDINAL STEEL FOR LOW CTE CONCRETE AS APPROVED BY THE ENGINEER					
SLAB THICKNESS AND BAR SIZE		REGULAR STEEL BARS	FIRST SPACING AT EDGE OR JOINT	ADDITIONAL STEEL BARS AT TRANSVERSE CONSTRUCTION JOINT (SECTION X-X)	
T (IN.)	BAR SIZE	SPACING c (IN.)	SPACING a (IN.)	SPACING 2 x c (IN.)	LENGTH L (IN.)
7.0	#5	7.5	3 TO 4	15	50
7.5	#5	7.0	3 TO 4	14	50
8.0	#6	10.0	3 TO 4	20	50
8.5	#6	9.5	3 TO 4	19	50
9.0	#6	9.0	3 TO 4	18	50
9.5	#6	8.5	3 TO 4	17	50
10.0	#6	8.0	3 TO 4	16	50
10.5	#6	7.5	3 TO 4	15	50
11.0	#6	7.0	3 TO 4	14	50
11.5	#6	6.75	3 TO 4	13.5	50
12.0	#6	6.50	3 TO 4	13	50
12.5	#6	6.25	3 TO 4	12.5	50
13.0	#6	6.0	3 TO 4	12	50

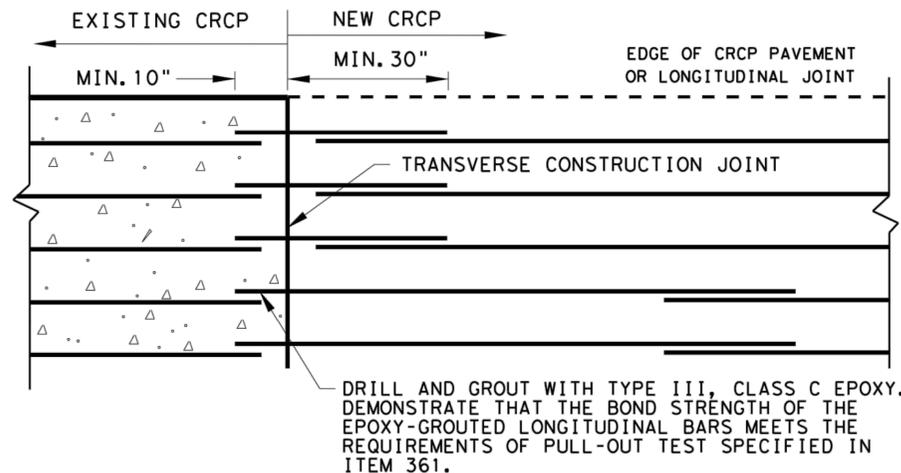


STAGGER THE LAP LOCATIONS SO THAT NO MORE THAN 1/3 OF THE LONGITUDINAL STEEL IS SPLICED IN ANY GIVEN 12-FT. WIDTH AND 2-FT. LENGTH OF THE PAVEMENT. ANY OTHER LAP CONFIGURATION MEETING THIS REQUIREMENT WILL BE ALLOWED.

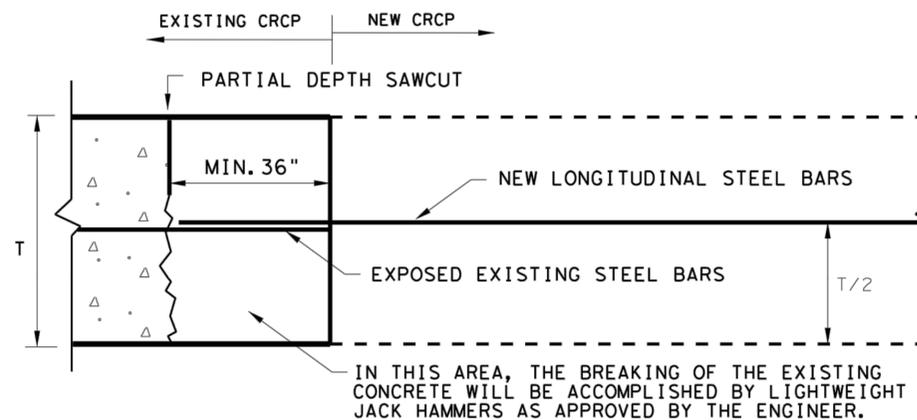
EXAMPLES OF LAP CONFIGURATION
PLAN VIEW (NOT TO SCALE)



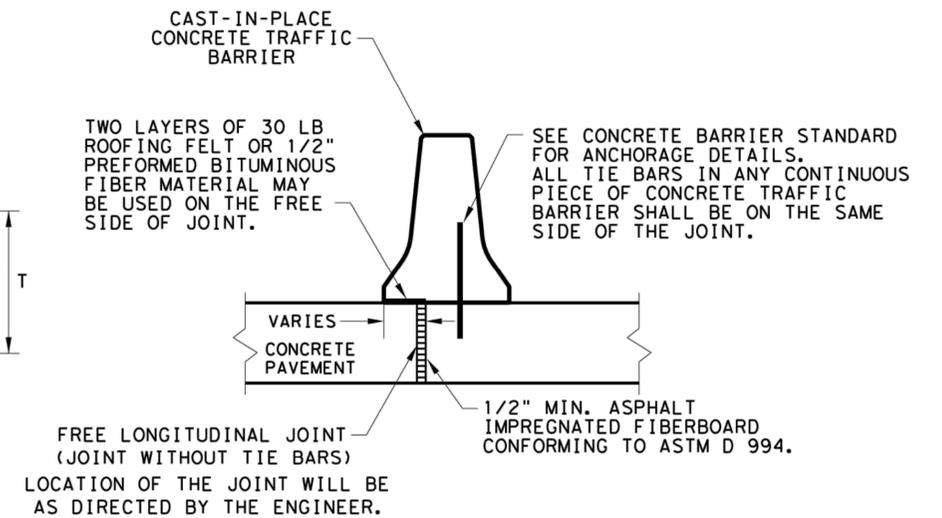
TRANSVERSE EXPANSION JOINT DETAIL AT BRIDGE APPROACH



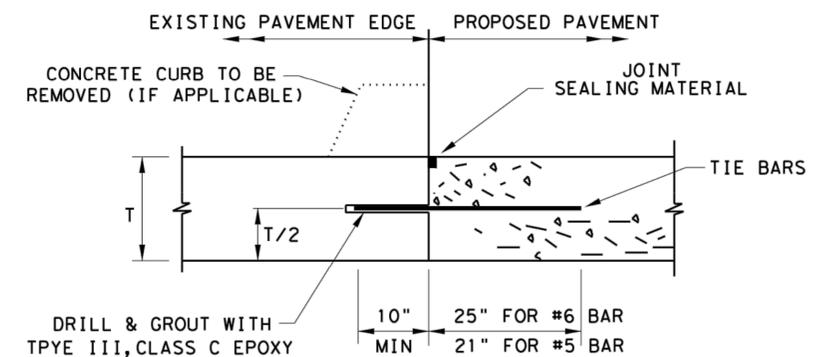
OPTION A: DRILL AND EPOXY
PLAN VIEW (NOT TO SCALE)



OPTION B: BREAKBACK AND LAP
TRANSVERSE TIE JOINT DETAIL
EXISTING CRCP TO NEW CRCP



FREE LONGITUDINAL JOINT DETAIL



- BEFORE WIDENING WORK, DEMONSTRATE THAT THE BOND STRENGTH OF THE EPOXY-GROUTED TIE BARS MEETS THE REQUIREMENTS OF PULL-OUT TEST SPECIFIED IN ITEM 361.
- SPACE TIE BARS AT 24" SPACING. USE #6 TIE BARS FOR 8" AND THICKER SLABS, USE #5 TIE BARS FOR LESS THAN 8" THICK SLABS.

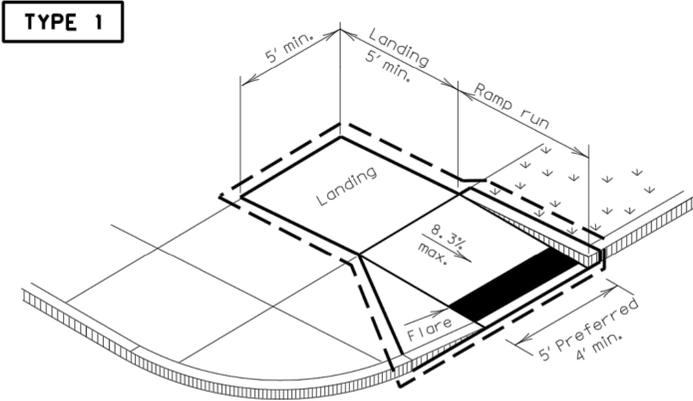
LONGITUDINAL WIDENING JOINT DETAIL

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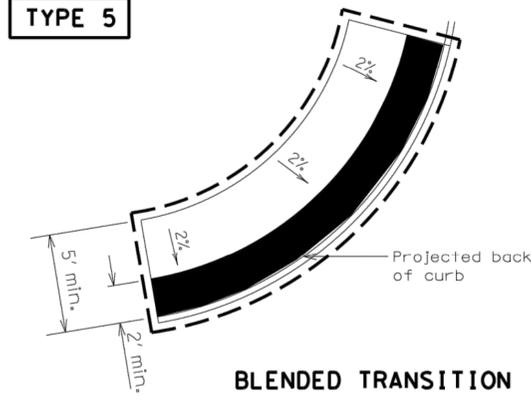
SHEET 2 OF 2

		Design Division Standard	
CONTINUOUSLY REINFORCED CONCRETE PAVEMENT ONE LAYER STEEL BAR PLACEMENT T - 7 to 13 INCHES CRCP(1)-13			
FILE: crcp113.dgn	DN: TxDOT	CK: AN	DW: HC/VP
© TxDOT October 2013	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

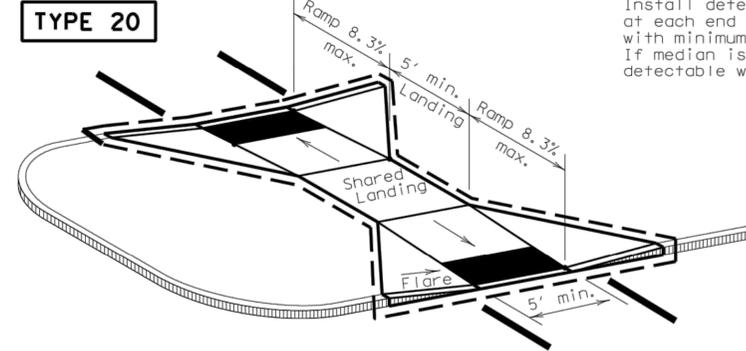
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PERPENDICULAR CURB RAMP

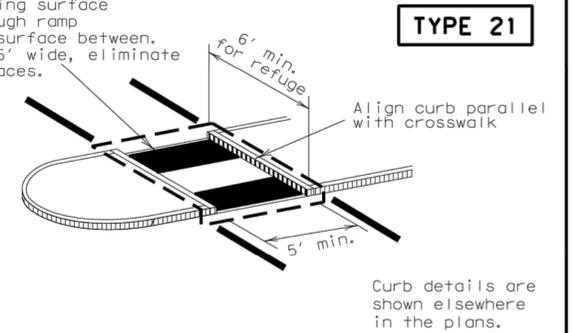


BLENDED TRANSITION



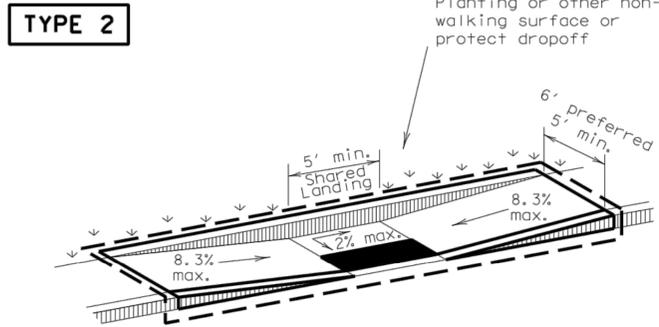
CURB RAMPS AT MEDIAN ISLANDS

Install detectable warning surface at each end of cut-through ramp with minimum 2' smooth surface between. If median is less than 6' wide, eliminate detectable warning surfaces.



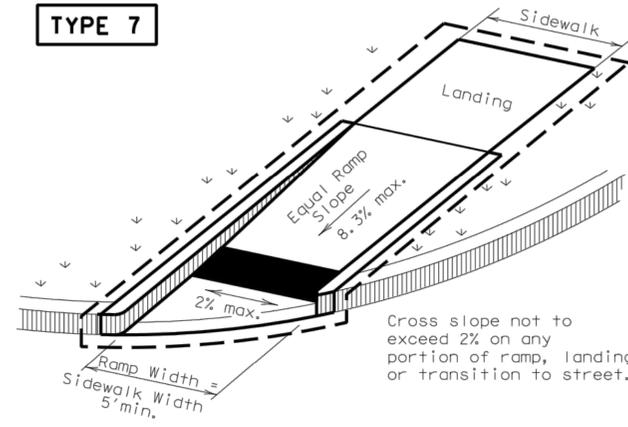
TYPE 21

Curb details are shown elsewhere in the plans.



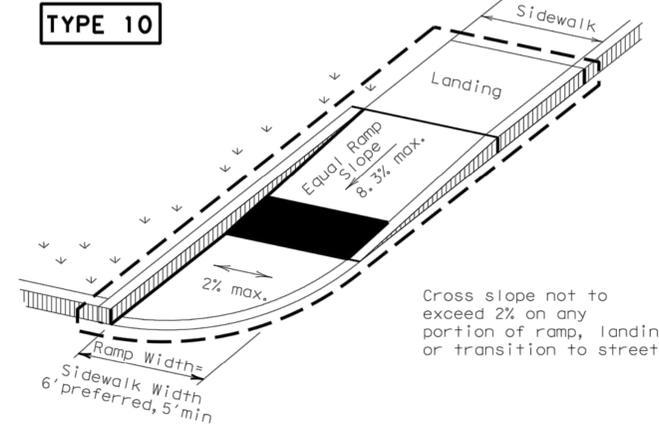
PARALLEL CURB RAMP

(Use only where water will not pond in the landing.)

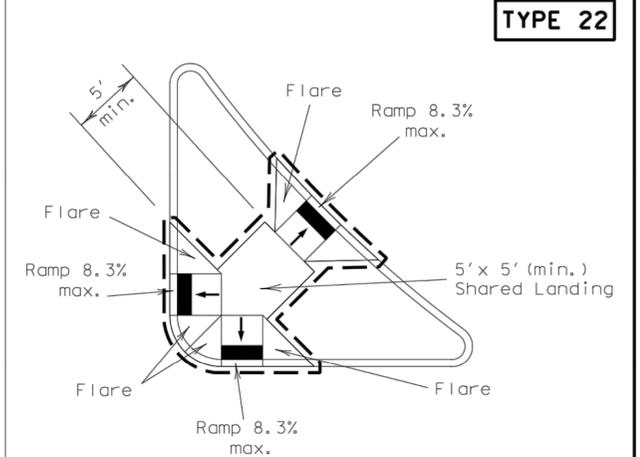


(Sidewalk set back from curb)

DIRECTIONAL RAMPS WITHIN RADIUS

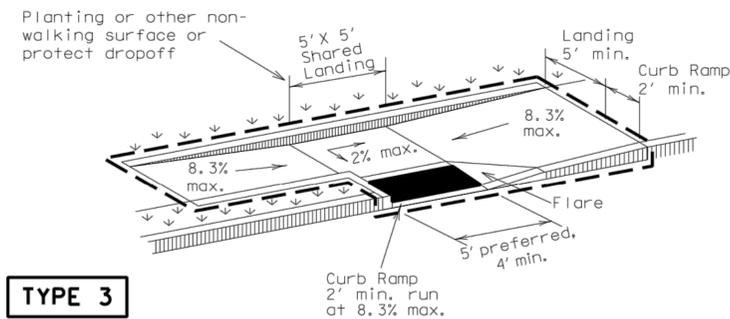


(Sidewalk adjacent to curb)

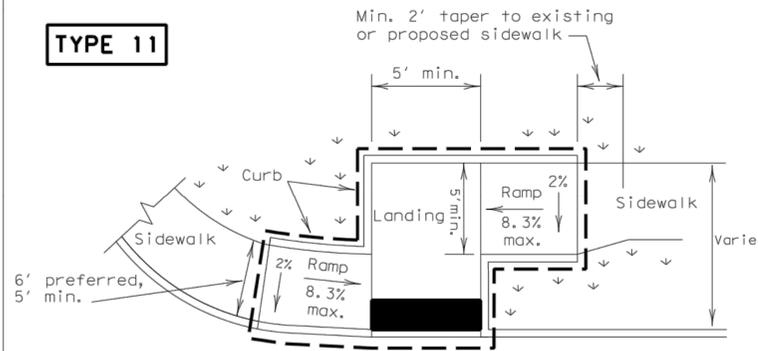


TYPE 22

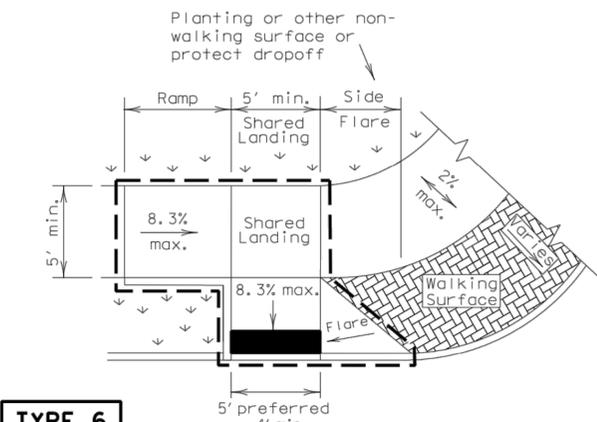
COMBINATION ISLAND RAMPS



TYPE 3



OFFSET PARALLEL CURB RAMP



TYPE 6

COMBINATION CURB RAMPS

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SHEET 1 OF 4



PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

NOTES / LEGEND:

See General Notes on sheet 2 of 4 for more information.

Denotes planting or non-walking surface not part of pedestrian circulation path.

--- Ramp Limits of Payment
 ■ Detectable Warning Surface

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
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REVISIONS				
VP June 13, 2012	DIST	COUNTY	SHEET NO.	

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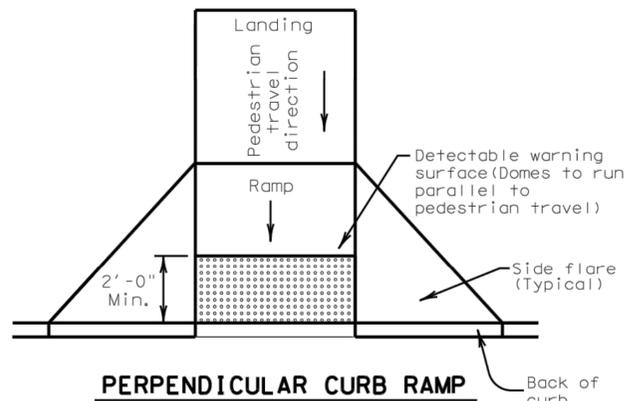
General Notes

Curb Ramps

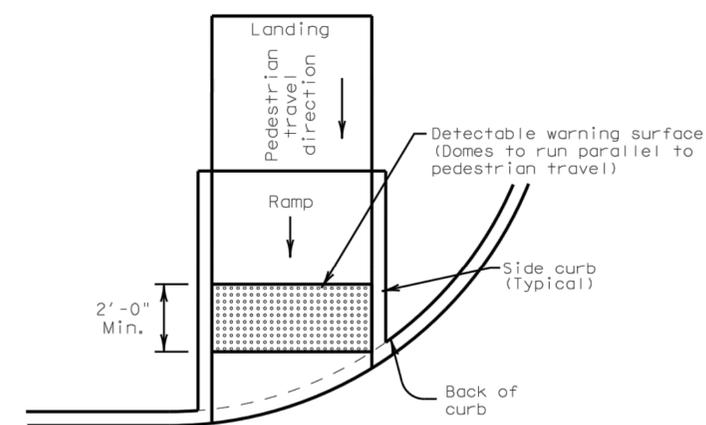
1. Install a curb ramp or blended transition at each pedestrian street crossing.
2. All slopes shown are maximum allowable. Lesser slopes that will still drain properly should be used. Adjust curb ramp length or grade of approach sidewalks as directed.
3. The minimum sidewalk width is 5'. Where the sidewalk is adjacent to the back of curb, a 6' sidewalk width is desirable. Where a 5' sidewalk cannot be provided due to site constraints, sidewalk width may be reduced to 4' for short distances. 5' x 5' passing areas at intervals not to exceed 200' are required.
4. Landings shall be 5' x 5' minimum with a maximum 2% slope in any direction.
5. Maneuvering space at the bottom of curb ramps shall be a minimum of 4' x 4' wholly contained within the crosswalk and wholly outside the parallel vehicular travel path.
6. Maximum allowable cross slope on sidewalk and curb ramp surfaces is 2%.
7. Provide flared sides where the pedestrian circulation path crosses the curb ramp. Flared sides shall be sloped at 10% maximum, measured parallel to the curb. Returned curbs may be used only where pedestrians would not normally walk across the ramp, either because the adjacent surface is planted, substantially obstructed, or otherwise protected.
8. Additional information on curb ramp location, design, light reflective value and texture may be found in the current edition of the Texas Accessibility Standards (TAS) and 16 TAC 68.102.
9. To serve as a pedestrian refuge area, the median should be a minimum of 6' wide, measured from back of curbs. Medians should be designed to provide accessible passage over or through them.
10. Small channelization islands, which do not provide a minimum 5' x 5' landing at the top of curb ramps, shall be cut through level with the surface of the street.
11. Crosswalk dimensions, crosswalk markings and stop bar locations shall be as shown elsewhere in the plans. At intersections where crosswalk markings are not required, curb ramps shall align with theoretical crosswalks unless otherwise directed.
12. Handrails are not required on curb ramps. Provide curb ramps wherever on accessible route crosses (penetrates) a curb.
13. Curb ramps and landings shall be constructed and paid for in accordance with Item 531 "Sidewalks".
14. Place concrete at a minimum depth of 5" for ramps, flares and landings, unless otherwise directed.
15. Provide a smooth transition where the curb ramps connect to the street.
16. Curbs shown on sheet 1 within the limits of payment are considered part of the curb ramp for payment, whether it is concrete curb, gutter, or combined curb and gutter.
17. Existing features that comply with TAS may remain in place unless otherwise shown on the plans.

Detectable Warning Material

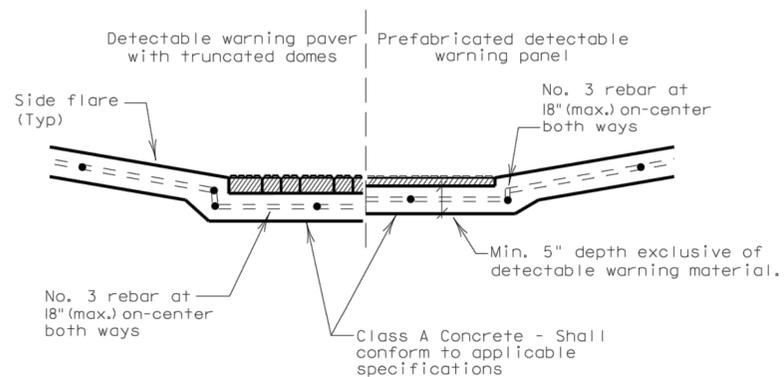
18. Curb ramps must contain a detectable warning surface that consists of raised truncated domes complying with Section 705 of the TAS. The surface must contrast visually with adjoining surfaces, including side flares. Furnish and install an approved cast-in-place dark brown or dark red detectable warning surface material adjacent to uncolored concrete, unless specified elsewhere in the plans.
19. Detectable Warning Materials must meet TxDOT Departmental Materials Specification DMS 4350 and be listed on the Material Producer List. Install products in accordance with manufacturer's specifications.
20. Detectable warning surfaces must be slip resistant and not allow water to accumulate.
21. Detectable warning surfaces shall be a minimum of 24" in depth in the direction of pedestrian travel, and extend the full width of the curb ramp or landing where the pedestrian access route enters the street.
22. Detectable warning surfaces shall be located so that the edge nearest the curb line is at the back of curb. Align the rows of domes to be perpendicular to the grade break between the ramp run and the street. Detectable warning surfaces may be curved along the corner radius.
23. Shaded areas on Sheet 1 of 4 indicate the approximate location for the detectable warning surface for each curb ramp type.



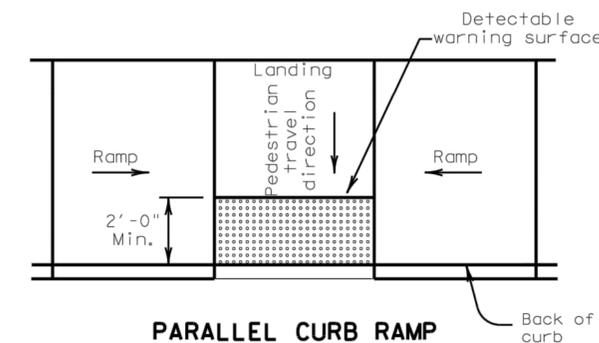
Typical placement of detectable warning surface on sloping ramp run.



Typical placement of detectable warning surface on sloping ramp run.



SECTION: CURB RAMP AT DETECTABLE WARNING



Typical placement of detectable warning surface on landing at street edge.

DETECTABLE WARNINGS

Detectable Warning Pavers

24. Furnish detectable warning paver units meeting all requirements of ASTM C-936, C-33. Lay in a two by two unit basket weave pattern or as directed.
25. Lay full-size units first followed by closure units consisting of at least 25 percent of a full unit. Cut detectable warning paver units using a power saw.

Sidewalks

26. Provide clear ground space at operable parts, including pedestrian push buttons. Operable parts shall be placed within one or more reach ranges specified in TAS 308.
27. Place traffic signal or illumination poles, ground boxes, controller boxes, signs, drainage facilities and other items so as not to obstruct the pedestrian access route or clear ground space.
28. Street grades and cross slopes shall be as shown elsewhere in the plans.
29. Changes in level greater than 1/4 inch are not permitted.
30. The least possible grade should be used to maximize accessibility. The running slope of sidewalks and crosswalks within the public right of way may follow the grade of the parallel roadway. Where a continuous grade greater than 5% must be provided, handrails may be desirable to improve accessibility. Handrails may also be needed to protect pedestrians from potentially hazardous conditions. If provided, handrails shall comply with TAS 505.
31. Handrail extensions shall not protrude into the usable landing area or into intersecting pedestrian routes.
32. Driveways and turnouts shall be constructed and paid for in accordance with Item "Intersections, Driveways and Turnouts". Sidewalks shall be constructed and paid for in accordance with Item, "Sidewalks".
33. Sidewalk details are shown elsewhere in the plans.

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SHEET 2 OF 4



PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
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REVISIONS				
VP June 13, 2012	DIST	COUNTY	SHEET NO.	

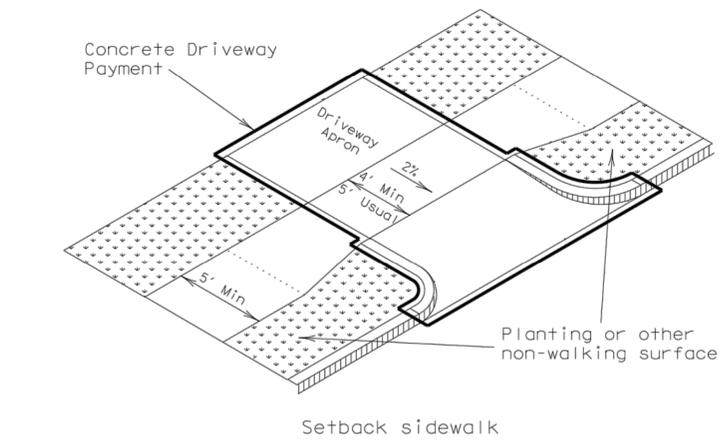
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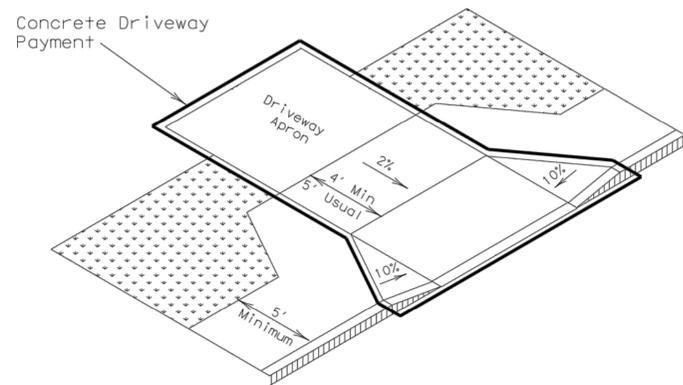
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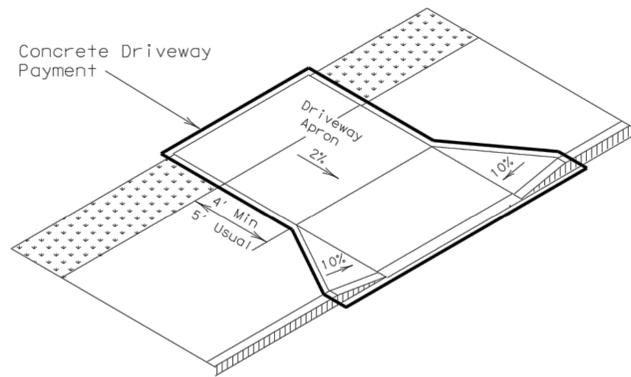
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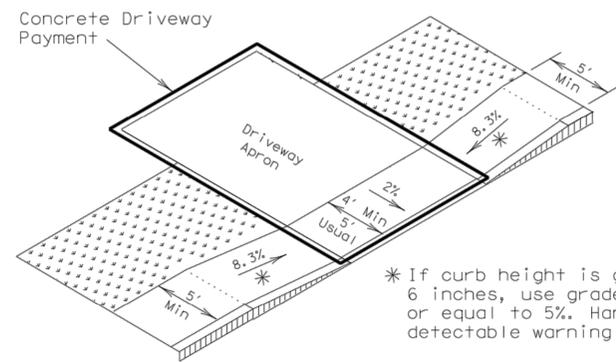
Setback sidewalk



Apron offset sidewalk



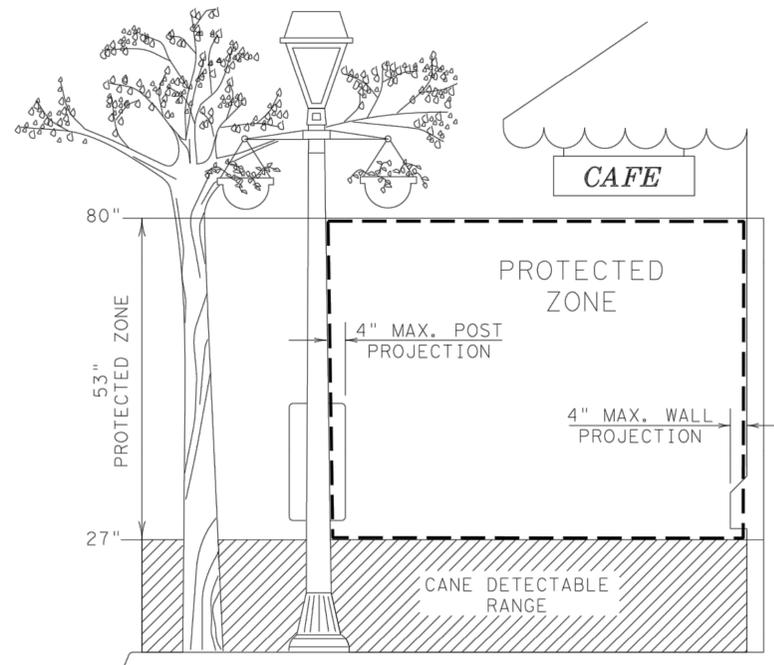
Wide sidewalk



Ramp sidewalk

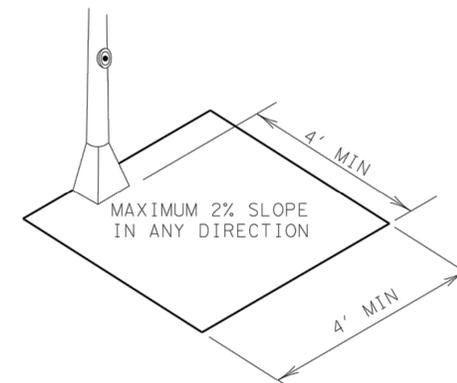
SIDEWALK TREATMENT AT DRIVEWAYS

* If curb height is greater than 6 inches, use grade less than or equal to 5%. Handrail and detectable warning not required.

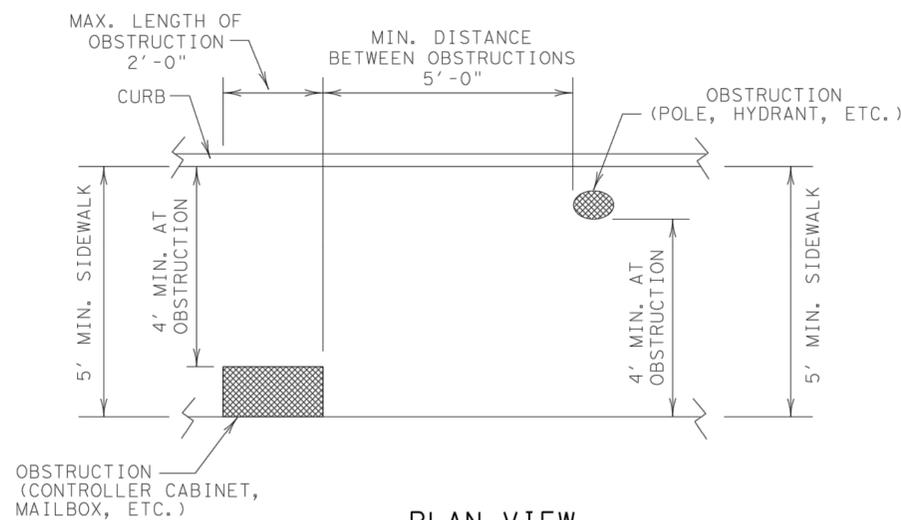


PROTECTED ZONE

In pedestrian circulation area, maximum 4" projection for post or wall mounted objects between 27" and 80" above the surface.

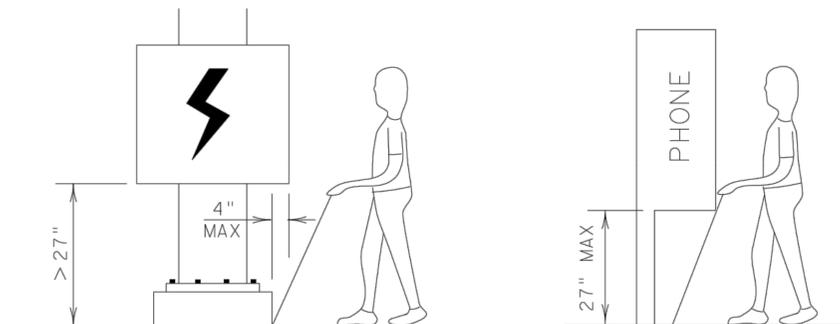


CLEAR GROUND SPACE ADJACENT TO PEDESTRIAN PUSH BUTTON



**PLAN VIEW
PLACEMENT OF STREET FIXTURES**

(ITEMS NOT INTENDED FOR PUBLIC USE. MINIMUM 4' x 4' CLEAR GROUND SPACE REQUIRED AT PUBLIC USE FIXTURES.)



When an obstruction of a height greater than 27" from the surface would create a protrusion of more than 4" into the pedestrian circulation area, construct additional curb or foundation at the bottom to provide a maximum 4" overhang.

Protruding objects of a height ≤ 27" are detectable by cane and do not require additional treatment.

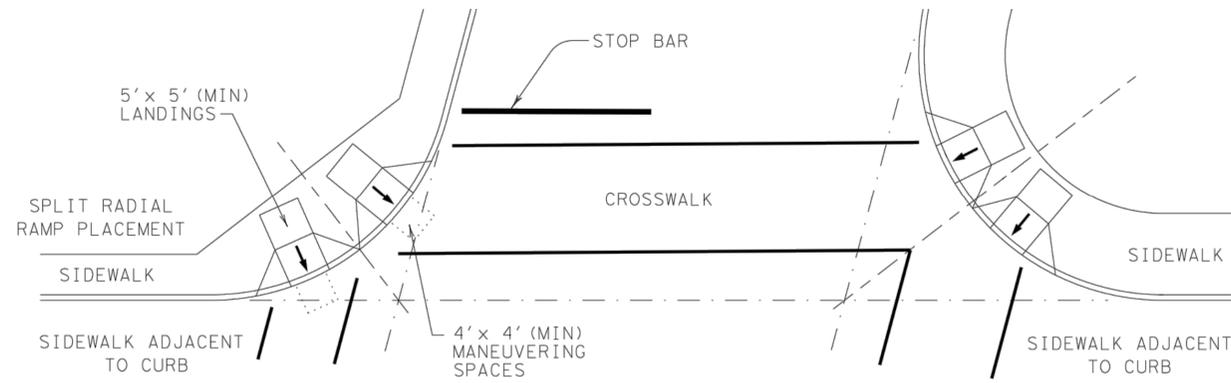
DETECTION BARRIER FOR VERTICAL CLEARANCE < 80"

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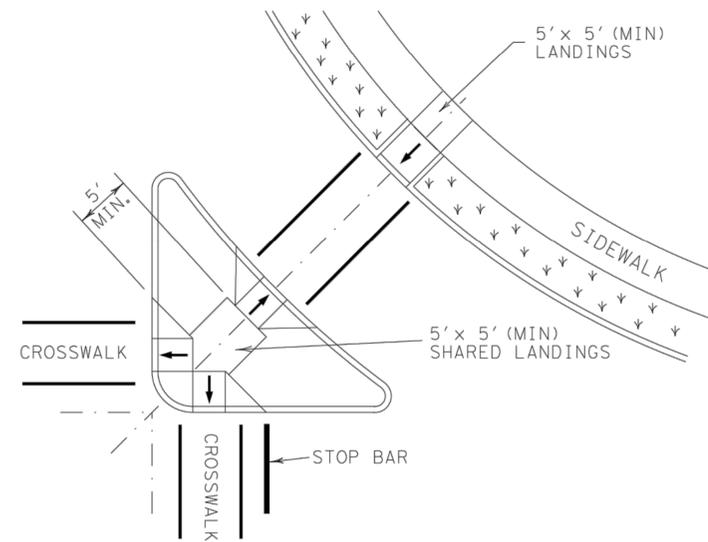
SHEET 3 OF 4

		Design Division Standard	
PEDESTRIAN FACILITIES CURB RAMPS			
PED-12A			
FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT
© TxDOT March 2002	CONT	SECT	JOB
REVISIONS			HIGHWAY
VP June 13, 2012	DIST	COUNTY	SHEET NO.

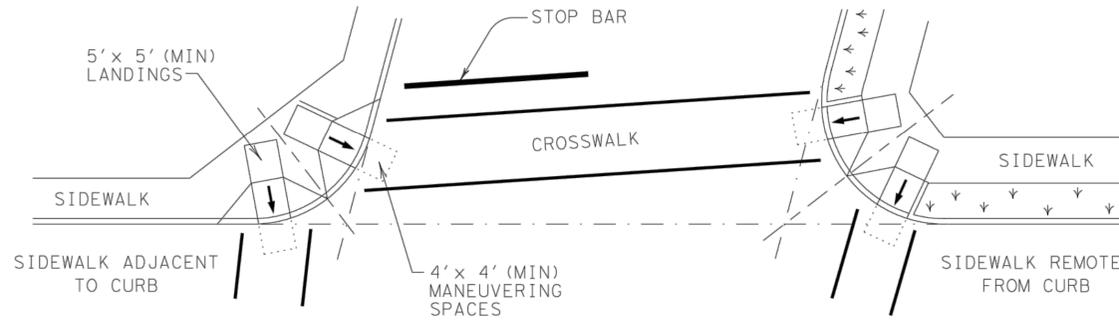
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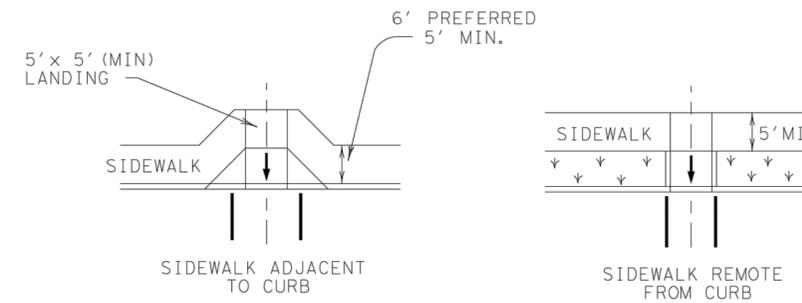
SKewed INTERSECTION WITH "LARGE" RADIUS



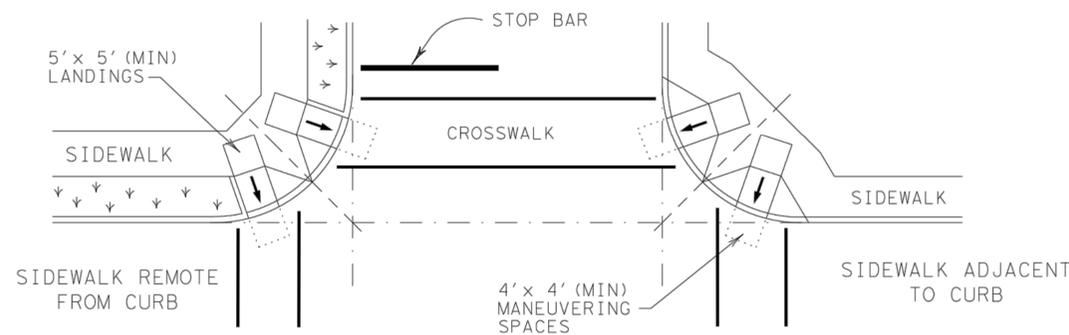
AT INTERSECTION W/FREE RIGHT TURN & ISLAND



SKewed INTERSECTION WITH "SMALL" RADIUS



MID-BLOCK PLACEMENT PERPENDICULAR RAMPS



NORMAL INTERSECTION WITH "SMALL" RADIUS

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SHEET 4 OF 4



PEDESTRIAN FACILITIES CURB RAMPS

PED-12A

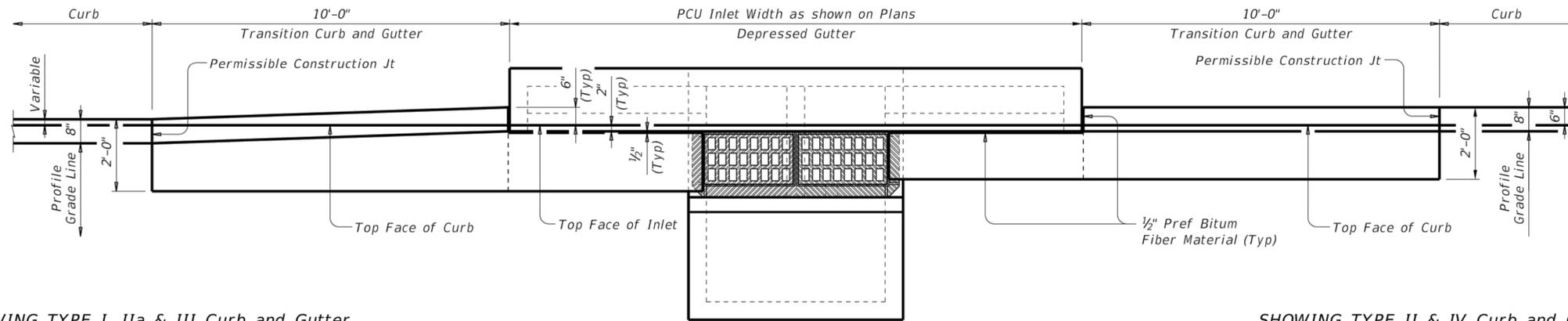
FILE: ped12a.dgn	DN: TxDOT	CK: RM	DW: TxDOT	CK: VP
© TxDOT March 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
VP June 13, 2012	DIST	COUNTY	SHEET NO.	

TYPICAL CROSSING LAYOUTS

DATE: FILE:

\\MSA-SERVER3\p\DRIVE\PROJECTS\1354\008 CAD\30 SHEETS\12A - C - TxDOT - PED12A - 0004.DWG

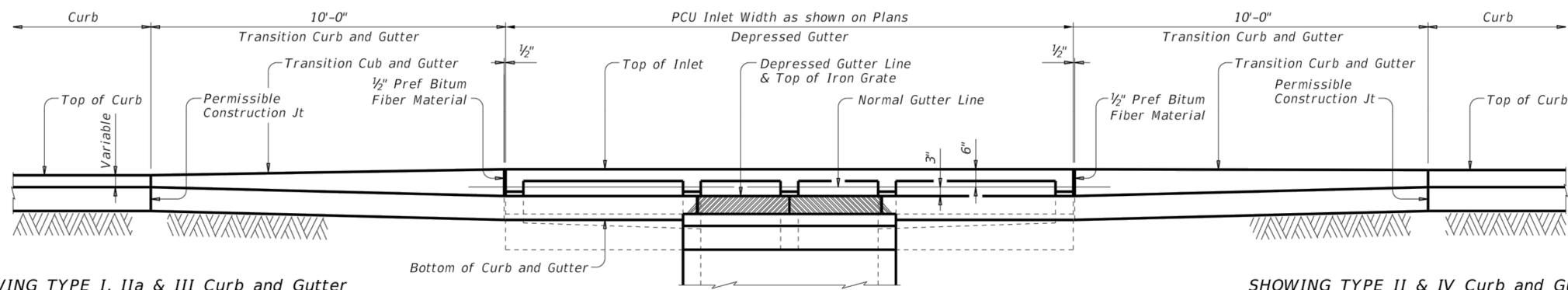
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SHOWING TYPE I, IIa & III Curb and Gutter

SHOWING TYPE II & IV Curb and Gutter

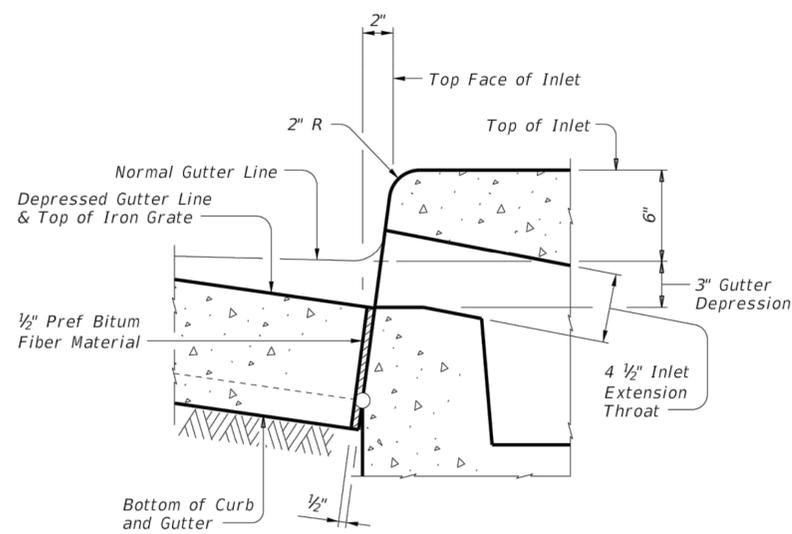
PLAN



SHOWING TYPE I, IIa & III Curb and Gutter

SHOWING TYPE II & IV Curb and Gutter

ELEVATION



SECTION AT GUTTER AND INLET

Reinforcing steel not shown for clarity.

CONSTRUCTION NOTES:
Align top face of curb with PCU Inlet as shown.

MATERIAL NOTES:
Provide 1/2" Preformed Bituminous Fiber Material.

GENERAL NOTES:
See Precast Curb Inlet Under Roadway standard for details and notes not shown.
See Concrete Curb and Gutter and Curb and Gutter s CCG-12 for details and notes not shown.
Curb and Gutter Transitions is paid for accordance with Item 529, "Concrete Curb, Combined Curb and Gutter."
Preformed Bituminous Fiber Material is to PCU Inlet.

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CURB AND GUTTER TRANSITION DETAILS FOR PCU INLET

CGT-PCU

FILE: prest14.dgn	DN: TxDOT	CK: AES	DW: JTR	CK: AES
©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
	DIST	COUNTY	SHEET NO.	

\\MSA-SERVER31P\DRIVE\PROJECTS\153454008\CAD\30-SHEET\SLV234-C-TXDOT-CGT-PCU-0001.DWG

DATE:
FILE:

TABLE OF VARIABLE DIMENSIONS AND QUANTITIES FOR ONE HEADWALL (4)

SLOPE	DIA OF PIPE, D	15 Degrees						30 Degrees						45 Degrees					
		Values for one Pipe			Values to be added for each add'l Pipe			Values for one Pipe			Values to be added for each add'l Pipe			Values for one Pipe			Values to be added for each add'l Pipe		
		W	Reinf (Lbs)	Conc (CY)	W	Reinf (Lbs)	Conc (CY)	W	Reinf (Lbs)	Conc (CY)	W	Reinf (Lbs)	Conc (CY)	W	Reinf (Lbs)	Conc (CY)	W	Reinf (Lbs)	Conc (CY)
2:1	12"	9'-4"	124	1.1	1'-9 3/4"	15	0.2	10'-5"	130	1.2	2'-0"	16	0.2	12'-9"	159	1.5	2'-5 3/4"	17	0.3
	15"	10'-7"	136	1.3	2'-3"	17	0.2	11'-10"	159	1.5	2'-6"	18	0.2	14'-6"	191	1.8	3'-0 3/4"	20	0.3
	18"	11'-11"	165	1.5	2'-9"	19	0.3	13'-3"	174	1.7	3'-1"	29	0.3	16'-3"	207	2.1	3'-9 1/4"	33	0.4
	21"	13'-2"	203	1.9	3'-2 1/4"	31	0.4	14'-9"	233	2.1	3'-6 3/4"	33	0.4	18'-0"	276	2.6	4'-4 1/4"	36	0.5
	24"	14'-6"	240	2.1	3'-8 1/4"	34	0.4	16'-2"	251	2.4	4'-1 3/4"	36	0.5	19'-10"	318	2.9	5'-0 3/4"	39	0.6
	27"	15'-9"	258	2.5	4'-0 3/4"	38	0.5	17'-7"	292	2.8	4'-6 1/4"	39	0.6	21'-7"	342	3.4	5'-6 1/4"	44	0.7
	30"	17'-1"	297	2.8	4'-5 3/4"	40	0.6	19'-1"	311	3.1	5'-0"	42	0.6	23'-4"	388	3.8	6'-1 3/4"	47	0.8
	33"	18'-5"	320	3.3	4'-9 3/4"	43	0.6	20'-6"	358	3.6	5'-4 3/4"	46	0.7	25'-1"	439	4.4	6'-7 1/4"	51	0.9
	36"	19'-8"	401	4.0	5'-3"	47	0.9	21'-11"	422	4.5	5'-10 3/4"	50	0.9	26'-10"	517	5.5	7'-2 1/4"	55	1.2
	42"	22'-3"	476	5.0	6'-0 3/4"	53	1.1	24'-10"	528	5.6	6'-8 3/4"	56	1.2	30'-5"	634	6.9	8'-3"	76	1.4
	48"	25'-11"	577	6.6	6'-9 3/4"	60	1.3	28'-10"	637	7.3	7'-7 1/4"	79	1.5	35'-4"	791	9.0	9'-3 3/4"	88	1.8
	54"	28'-6"	711	7.8	7'-9"	83	1.6	31'-9"	781	8.7	8'-8"	87	1.8	38'-11"	958	10.7	10'-7 1/4"	97	2.2
60"	31'-1"	805	9.2	8'-6 1/4"	91	1.9	34'-8"	881	10.2	9'-6 1/4"	97	2.1	42'-5"	1113	12.5	11'-8"	124	2.6	
66"	33'-8"	907	10.6	9'-0 3/4"	98	2.1	37'-6"	1028	11.8	10'-1 1/4"	102	2.4	46'-0"	1235	14.5	12'-4 1/4"	132	2.9	
72"	36'-3"	1071	12.1	9'-8"	105	2.4	40'-5"	1207	13.5	10'-9 1/4"	110	2.6	49'-6"	1446	16.6	13'-2 1/4"	141	3.2	
3:1	12"	13'-6"	178	1.6	1'-9 3/4"	15	0.2	15'-0"	189	1.8	2'-0"	15	0.2	18'-5"	237	2.2	2'-5 3/4"	17	0.2
	15"	15'-3"	212	1.9	2'-3"	17	0.2	17'-0"	223	2.1	2'-6"	17	0.3	20'-10"	276	2.6	3'-0 3/4"	20	0.3
	18"	17'-1"	231	2.3	2'-9"	19	0.3	19'-1"	259	2.5	3'-1"	29	0.3	23'-4"	318	3.1	3'-9 1/4"	32	0.4
	21"	18'-11"	306	2.7	3'-2 1/4"	31	0.4	21'-1"	339	3.0	3'-6 3/4"	33	0.4	25'-10"	413	3.7	4'-4 1/4"	36	0.5
	24"	20'-8"	345	3.1	3'-8 3/4"	35	0.4	23'-1"	384	3.5	4'-1 3/4"	36	0.5	28'-3"	462	4.2	5'-0 3/4"	40	0.6
	27"	22'-6"	376	3.7	4'-0 3/4"	38	0.5	25'-1"	438	4.1	4'-6 1/4"	39	0.6	30'-9"	522	5.0	5'-6 1/4"	44	0.7
	30"	24'-4"	422	4.1	4'-5 3/4"	40	0.6	27'-2"	466	4.6	5'-0"	42	0.6	33'-3"	578	5.6	6'-1 3/4"	47	0.8
	33"	26'-2"	476	4.8	4'-10"	43	0.6	29'-2"	522	5.3	5'-4 3/4"	46	0.7	35'-9"	644	6.5	6'-7 1/4"	51	0.9
	36"	27'-11"	590	5.9	5'-3 1/4"	47	0.8	31'-2"	645	6.6	5'-10 3/4"	50	0.9	38'-2"	787	8.0	7'-2 1/4"	56	1.2
	42"	31'-7"	684	7.3	6'-0 1/4"	53	1.1	35'-3"	776	8.2	6'-8 3/4"	56	1.2	43'-2"	933	10.0	8'-3"	79	1.4
	48"	36'-9"	880	9.6	6'-9 3/4"	61	1.3	41'-0"	953	10.7	7'-7 1/4"	81	1.5	50'-2"	1166	13.1	9'-3 3/4"	88	1.8
	54"	40'-5"	1065	11.4	7'-9"	85	1.6	45'-0"	1185	12.7	8'-8"	89	1.8	55'-2"	1435	15.5	10'-7 1/4"	97	2.2
60"	44'-0"	1224	13.3	8'-6 1/4"	93	1.9	49'-1"	1356	14.8	9'-6 1/4"	96	2.1	60'-1"	1627	18.2	11'-8"	124	2.6	
66"	47'-7"	1357	15.4	9'-1"	98	2.1	53'-1"	1497	17.2	10'-1 1/4"	103	2.3	65'-1"	1834	21.1	12'-4 1/4"	130	2.9	
72"	51'-3"	1624	17.7	9'-8"	105	2.3	57'-2"	1787	19.7	10'-9 1/4"	109	2.6	70'-0"	2210	24.1	13'-2 1/4"	139	3.2	
4:1	12"	17'-7"	232	2.1	1'-9 3/4"	15	0.2	19'-8"	259	2.4	2'-0"	16	0.2	24'-0"	314	2.9	2'-5 3/4"	18	0.2
	15"	19'-11"	272	2.5	2'-3"	17	0.2	22'-3"	301	2.8	2'-6"	18	0.3	27'-3"	361	3.5	3'-0 3/4"	21	0.3
	18"	22'-3"	313	3.0	2'-9"	19	0.3	24'-10"	344	3.3	3'-1"	29	0.3	30'-5"	427	4.0	3'-9 1/4"	32	0.4
	21"	24'-7"	407	3.6	3'-2 1/4"	31	0.4	27'-5"	446	4.0	3'-6 3/4"	33	0.4	33'-7"	549	4.9	4'-4 1/4"	36	0.5
	24"	26'-11"	455	4.1	3'-8 3/4"	35	0.4	30'-0"	499	4.5	4'-1 3/4"	36	0.5	36'-9"	609	5.6	5'-0 3/4"	40	0.6
	27"	29'-3"	514	4.8	4'-0 3/4"	38	0.5	32'-7"	562	5.4	4'-6 1/4"	40	0.6	39'-11"	703	6.6	5'-6 1/4"	43	0.7
	30"	31'-7"	568	5.4	4'-5 3/4"	40	0.6	35'-3"	620	6.0	5'-0"	42	0.6	43'-2"	768	7.4	6'-1 3/4"	49	0.8
	33"	33'-11"	634	6.2	4'-10"	43	0.7	37'-10"	710	7.0	5'-4 3/4"	46	0.7	46'-4"	848	8.5	6'-7 1/4"	52	0.9
	36"	36'-3"	776	7.7	5'-3"	48	0.9	40'-5"	868	8.6	5'-10 3/4"	49	0.9	49'-6"	1058	10.6	7'-2 1/4"	56	1.1
	42"	40'-11"	921	9.6	6'-0 1/4"	53	1.0	45'-7"	1022	10.7	6'-8 3/4"	57	1.2	55'-10"	1262	13.1	8'-3"	78	1.4
	48"	47'-7"	1152	12.6	6'-10"	61	1.3	53'-1"	1268	14.0	7'-7 1/4"	80	1.5	65'-1"	1579	17.2	9'-3 3/4"	86	1.8
	54"	52'-3"	1416	14.9	7'-9 1/4"	86	1.6	58'-4"	1589	16.6	8'-8"	89	1.8	71'-5"	1916	20.4	10'-7 1/4"	95	2.2
60"	56'-11"	1606	17.5	8'-6 3/4"	92	1.9	63'-6"	1798	19.5	9'-6 1/4"	95	2.1	77'-9"	2184	23.9	11'-8"	122	2.6	
66"	61'-7"	1811	20.2	9'-0 3/4"	97	2.1	68'-8"	2011	22.5	10'-1 1/4"	101	2.4	84'-2"	2464	27.6	12'-4 1/4"	131	2.9	
72"	66'-3"	2142	23.2	9'-8"	104	2.4	73'-11"	2371	25.9	10'-9 1/4"	108	2.6	90'-6"	2929	31.7	13'-2 1/4"	138	3.2	
6:1	12"	25'-11"	342	3.1	1'-9 3/4"	15	0.2	28'-10"	374	3.5	2'-0"	16	0.2	35'-4"	456	4.3	2'-5 3/4"	17	0.2
	15"	29'-3"	390	3.7	2'-3"	17	0.2	32'-7"	442	4.2	2'-6"	18	0.2	39'-11"	549	5.1	3'-0 3/4"	20	0.3
	18"	32'-7"	459	4.4	2'-9"	20	0.3	36'-4"	515	4.9	3'-1"	29	0.3	44'-7"	629	6.0	3'-9 1/4"	33	0.4
	21"	36'-0"	608	5.3	3'-2 1/4"	31	0.4	40'-2"	660	5.9	3'-6 3/4"	33	0.4	49'-2"	823	7.2	4'-4 1/4"	38	0.5
	24"	39'-4"	672	6.0	3'-8 3/4"	35	0.4	43'-11"	748	6.7	4'-1 3/4"	36	0.5	53'-9"	920	8.2	5'-0 3/4"	42	0.6
	27"	42'-8"	770	7.1	4'-0 3/4"	38	0.5	47'-8"	852	8.0	4'-6 1/4"	41	0.5	58'-4"	1039	9.7	5'-6 1/4"	45	0.7
	30"	46'-1"	839	8.0	4'-5 3/4"	40	0.6	51'-5"	949	8.9	5'-0"	44	0.6	62'-11"	1154	10.9	6'-1 3/4"	48	0.8
	33"	49'-5"	947	9.2	4'-10"	45	0.7	55'-2"	1040	10.3	5'-4 3/4"	48	0.7	67'-6"	1284	12.6	6'-7 1/4"	50	0.9
	36"	52'-10"	1151	11.4	5'-3"	49	0.8	58'-11"	1287	12.7	5'-10 3/4"	51	1.0	72'-1"	1575	15.6	7'-2 1/4"	55	1.1
	42"	59'-6"	1365	14.2	6'-0 1/4"	55	1.0	66'-5"	1522	15.8	6'-8 3/4"	57	1.2	81'-4"	1867	19.4	8'-3"	76	1.4
	48"	69'-4"	1729	18.5	6'-10"	59	1.3	77'-4"	1934	20.7	7'-7 1/4"	79	1.5	94'-9"	2360	25.3	9'-3 3/4"	86	1.8
	54"	76'-1"	2130	22.0	7'-9 1/4"	83	1.6	84'-10"	2370	24.6	8'-8"	87	1.8	103'-11"	2904	30.1	10'-7 1/4"	95	2.2
60"	82'-10"	2414	25.8	8'-6 3/4"	90	1.9	92'-5"	2673	28.8	9'-6 1/4"	94	2.1	113'-2"	3286	35.3	11'-8"	122	2.6	
66"	89'-7"	2712	29.9	9'-0 3/4"	96	2.1	99'-11"	3030	33.3	10'-1 1/4"	101	2.4	122'-4"	3689	40.8	12'-4 1/4"	130	2.9	
72"	96'-3"	3210	34.2	9'-8"	102	2.4	107'-5"	3572	38.2	10'-9 1/4"	108	2.6	131'-6"	4364	46.8	13'-2 1/4"	139	3.2	

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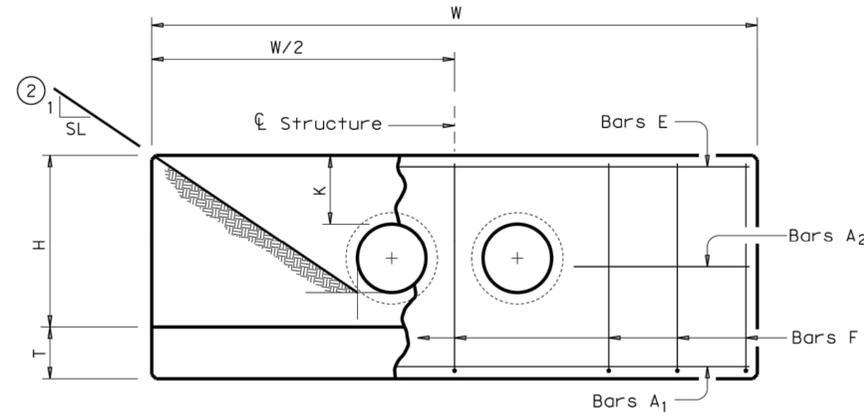
DATE: FILE:

TABLE OF CONSTANT DIMENSIONS

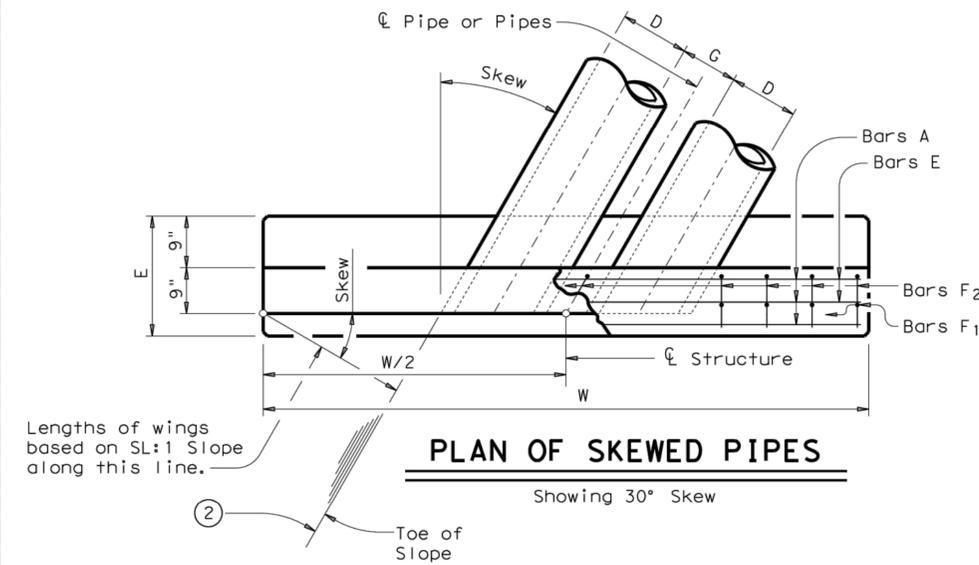
DIA OF PIPE, D	G	K	H	T	E
12"	9"	1'-0"	2'-8"	9"	1'-9"
15"	11"	1'-0"	2'-11"	9"	1'-9"
18"	1'-2"	1'-0"	3'-2"	9"	1'-9"
21"	1'-4"	1'-0"	3'-5"	9"	2'-0"
24"	1'-7"	1'-0"	3'-8"	9"	2'-0"
27"	1'-8"	1'-0"	3'-11"	9"	2'-3"
30"	1'-10"	1'-0"	4'-2"	9"	2'-3"
33"	1'-11"	1'-0"	4'-5"	9"	2'-6"
36"	2'-1"	1'-0"	4'-8"	1'-0"	2'-6"
42"	2'-4"	1'-0"	5'-2"	1'-0"	2'-9"
48"	2'-7"	1'-3"	5'-11"	1'-0"	3'-0"
54"	3'-0"	1'-3"	6'-5"	1'-0"	3'-3"
60"	3'-3"	1'-3"	6'-11"	1'-0"	3'-6"
66"	3'-3"	1'-3"	7'-5"	1'-0"	3'-9"
72"	3'-4"	1'-3"	7'-11"	1'-0"	4'-0"

TABLE OF REINFORCING STEEL (4)

Bar	Size	Spa	No.
A1	# 5	~	2
A2	# 5	1'-6"	~
E	# 5	~	2
F	# 5	1'-0"	~

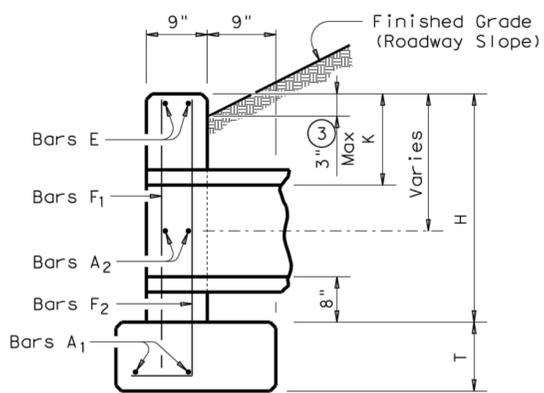


ELEVATION

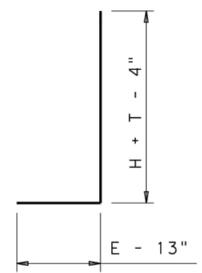


PLAN OF SKEWED PIPES

Lengths of wings based on SL:1 Slope along this line.



SECTION



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TABLE OF DIMENSIONS & REINFORCING STEEL (Wings for One Structure End)

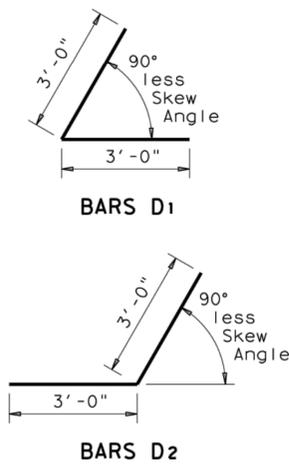
Maximum Wingwall Height Hw	Dimensions				Variable Reinforcing				Estimated Quantities per ft of wing (2-Wings)		Estimated Quantities per ft of Toewall (1-Toewall)	
	W	X	Y	Z	Bars J1	Bars J2	Size	Spa	Reinf (LB/FT)	Conc (CY/FT)	Reinf (LB/FT)	Conc (CY/FT)
2'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	48.64	0.406	6.85	0.071
2'-9"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.31	0.424	6.85	0.071
3'-0"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	49.98	0.444	6.85	0.071
3'-3"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.32	0.462	6.85	0.071
3'-6"	2'-10"	10"	1'-0"	7"	#4	1'-0"	#4	1'-0"	53.98	0.480	6.85	0.071
4'-0"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	55.77	0.532	6.85	0.071
4'-6"	3'-2"	1'-2"	1'-0"	7"	#4	1'-0"	#4	1'-0"	59.77	0.568	6.85	0.071
5'-0"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	63.45	0.632	6.96	0.075
5'-6"	3'-9"	1'-7"	1'-2"	7"	#4	1'-0"	#4	1'-0"	67.46	0.668	6.96	0.075
6'-0"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	80.67	0.730	7.07	0.078
6'-6"	4'-4"	2'-0"	1'-4"	7"	#5	1'-0"	#5	1'-0"	85.05	0.768	7.07	0.078
7'-0"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	92.15	0.864	8.07	0.093
7'-6"	5'-0"	2'-3"	1'-9"	8"	#5	1'-0"	#5	1'-0"	96.54	0.902	8.07	0.093
8'-0"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	139.04	0.962	8.13	0.095
8'-6"	5'-6"	2'-8"	1'-10"	8"	#5	6"	#5	6"	144.47	1.000	8.13	0.095
9'-6"	6'-0"	2'-10"	2'-2"	9"	#5	6"	#5	6"	156.93	1.136	8.41	0.110
10'-6"	6'-5"	3'-0"	2'-5"	9"	#6	6"	#5	6"	196.27	1.234	8.57	0.117
11'-6"	7'-2"	3'-6"	2'-8"	11"	#6	6"	#6	6"	230.13	1.438	9.52	0.140
12'-6"	7'-8"	3'-9"	2'-11"	1'-0"	#7	6"	#6	6"	283.41	1.592	9.74	0.157
13'-6"	8'-2"	4'-0"	3'-2"	1'-2"	#8	6"	#6	6"	348.72	1.804	10.02	0.186
14'-6"	8'-10"	4'-5"	3'-5"	1'-4"	#9	6"	#6	6"	432.94	2.046	10.30	0.218
15'-6"	9'-6"	4'-10"	3'-8"	1'-6"	#9	6"	#7	6"	489.52	2.302	11.24	0.253
16'-0"	9'-11"	5'-0"	3'-11"	1'-7"	#9	6"	#7	6"	505.72	2.448	11.47	0.279

TABLE OF WINGWALL REINFORCING (2-Wings)

Bar	Size	No.	Spa
D1	#6	~	1'-0"
D2	#6	~	1'-0"
E1	#4	~	1'-0"
F	#4	~	1'-0"
G	#6	~	8"
M1	#4	4	~
P	#4	~	1'-0"
V	#4	~	1'-0"

TABLE OF TOEWALL REINFORCING

Bar	Size	No.	Spa
J3	#4	~	1'-0"
M2	#4	2	~
E2	#4	~	1'-0"



WING DIMENSION CALCULATIONS:

Formulas: (All values are in Feet)

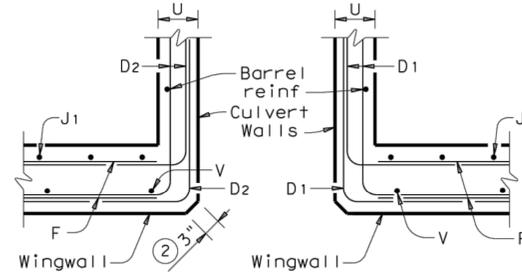
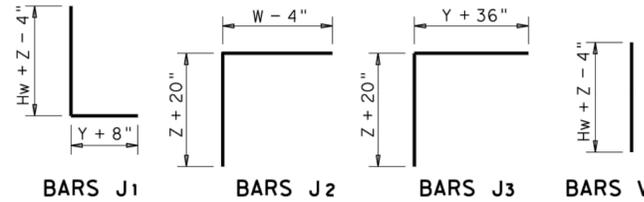
$Hw = H + T + C$
 $Lw = (Hw) (SL) \div \text{Cosine } \theta \text{ for Ty PW-1}$
 $= (Hw - 1') (SL) \div \text{Cosine } \theta \text{ for Ty PW-2 and } Hw \geq 4'$
 $= (Hw - 0.5') (SL) \div \text{Cosine } \theta \text{ for Ty PW-2 and } Hw < 4'$

For Cast-in-place culverts:
 $Ltw = [(N) (S) + (N + 1) (U)] \div \text{Cosine } \theta$

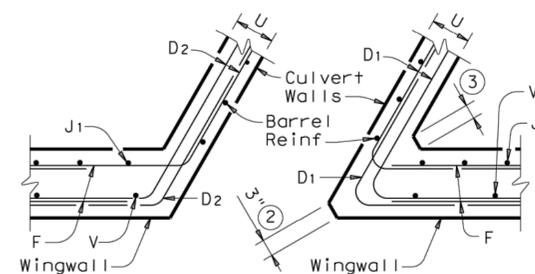
For Precast culverts:
 $Ltw = [(N) (2U + S) + (N - 1) (0.5')] \div \text{Cosine } \theta$
 Total Wingwall Area (Two Wings ~ SF)
 $= (2) (Hw) (Lw) \text{ for Ty PW-1}$
 $= (2) (Hw) (Lw) - 6 \text{ SF for Ty PW-2 and } Hw \geq 4'$
 $= (2) (Hw) (Lw) - 1.5 \text{ SF for Ty PW-2 and } Hw < 4'$

Hw = Height of Wingwall
 Lw = Length of Wingwall
 Ltw = Culvert Toewall Length
 N = Number of Culvert Spans
 $SL:1$ = Channel Slope ratio. (Horizontal: 1 Vertical, Usual value is 2:1)
 θ = Culvert Skew

See applicable box culvert standard for S, H, T and U values.



SECTION C-C



SECTION C-C

- Skew Angle = 0°
- At discharge end, chamfer may be 3/4".
- For 15° Skew ~ 1"
For 30° Skew ~ 2"
For 45° Skew ~ 3"
- Quantities shown are for two Type PW-1 wings. Adjust concrete volume for Type PW-2 wings. To determine estimated quantities for two wings, multiply the tabulated values by Lw. Quantities shown do not include weight of Bars D.
- Provide weepholes for Hw = 5'-0" and greater. Fill around weepholes with coarse gravel.
- Extend Bars E2 1'-6" minimum into the wingwall footing.
- Lap Bars M1 1'-6" minimum with Bars M2.
- Bars G equally spaced at 8" maximum, place as shown. Provide at least two pair Bars G per wing.
- 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, curbs cannot project more than 3" above finished grade.
 - For structures with bridge rail, build curbs flush with finished grade.
 Reduce curb heights, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- 1'-0" typical. 2'-0" typical when RAC standard is referenced elsewhere in the plans.
- 3'-0" for Hw < 4'.
- 6" for Hw < 4'.

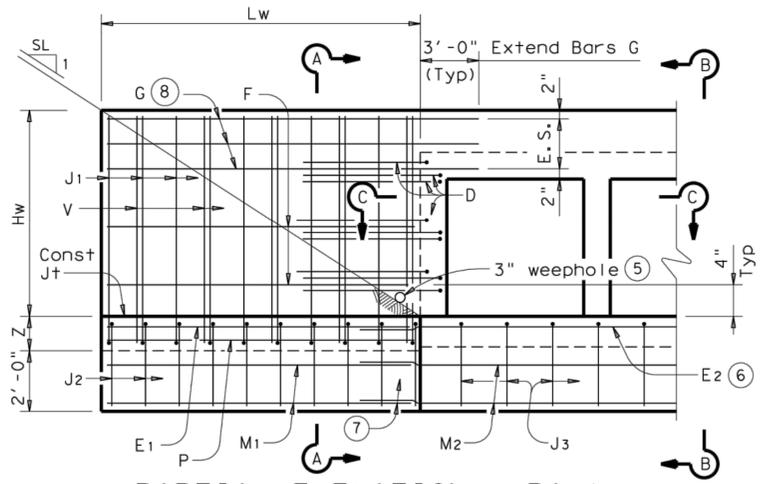
GENERAL NOTES:

Designed in accordance with AASHTO LRFD Bridge Design Specifications.
 Provide Class "C" Concrete (f'c = 3,600 psi Min) and Grade 60 reinforcing steel.
 Provide 1/4" Min clear cover to reinforcing steel.
 Depth of toewalls for wingwalls and culverts may be reduced or eliminated when founded on solid rock, when directed by the Engineer.
 See BCS sheet for wingwall type and additional dimensions and information.
 The quantities for concrete and reinforcing steel resulting from the formulas given on this sheet are for the Contractor's information only.

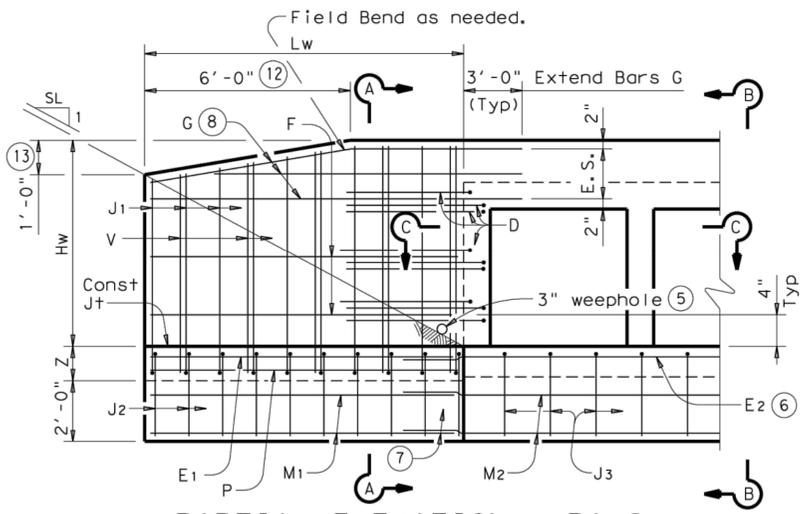
DESIGNER NOTES:

Type PW-1 can be used for all applications where railing is to be mounted to the wingwall.
 Type PW-2 can only be used for applications where a railing is mounted to the wingwall.

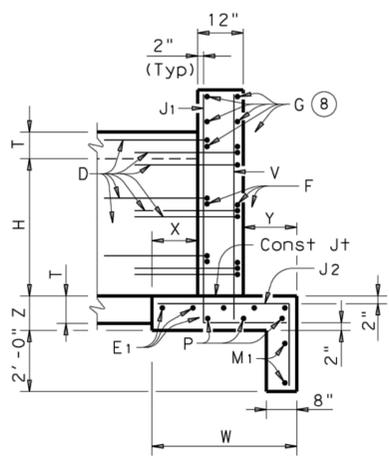
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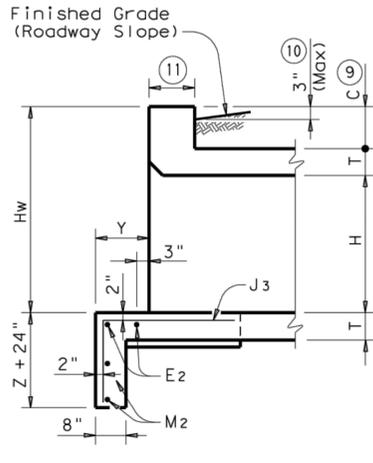
PARTIAL ELEVATION - PW-1



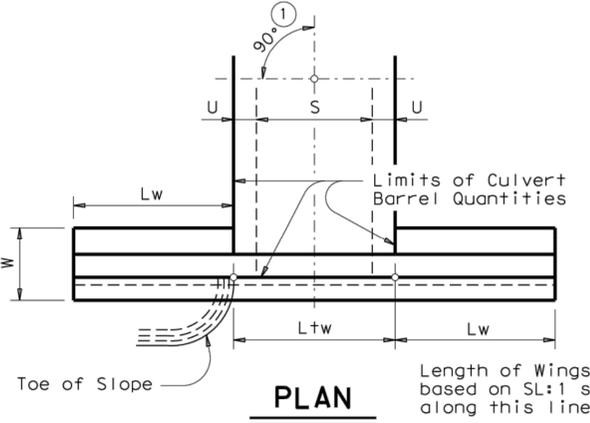
PARTIAL ELEVATION - PW-2



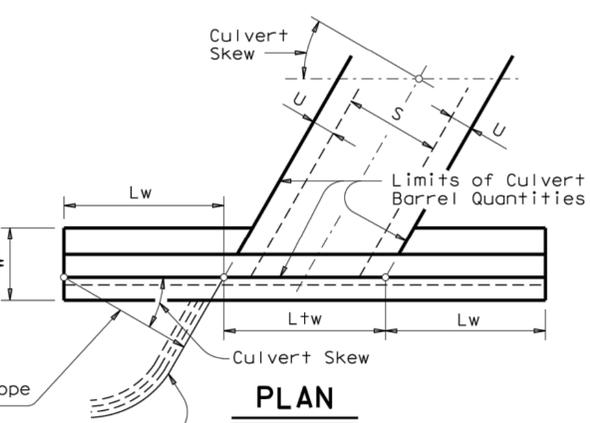
SECTION A-A (Showing Wing Reinf)



SECTION B-B (Showing Wing Reinf)



DETAILS FOR NON-SKEWED BOX CULVERTS



DETAILS FOR SKEWED BOX CULVERTS (Showing 30° Skew)

Bridge Division Standard

CONCRETE WINGWALLS WITH PARALLEL WINGS FOR BOX CULVERTS TYPES PW-1 AND PW-2

PW

FILE: pwstde01.dgn	DN: GAF	CK: CAT	DW: TxDOT	CK: GAF
©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Reinforcing Quantities.				
01-12: PW-1 & PW-2.	DIST	COUNTY		SHEET NO.

V:\S&P\310 DRIVE\PROJECTS\15454008 CAD\30 SHEETS\SLV254 - C - TXDOT - PW - 0001.DWG

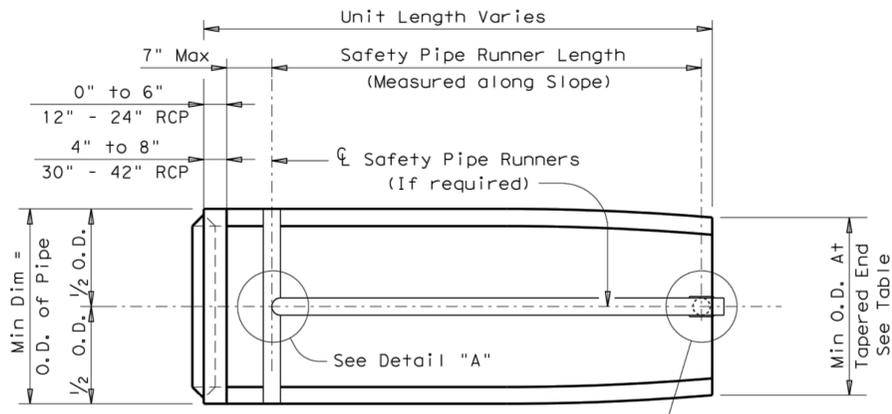
DATE: FILE:

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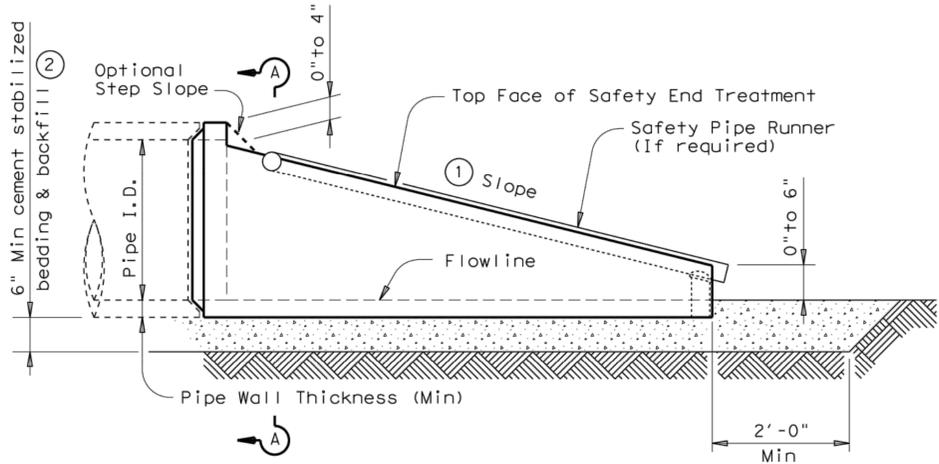
Maximum Safety Pipe Runner Lengths & Required Safety Pipe Runner Sizes

Maximum Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11' - 2"	3" STD	3.500"	3.068"
15' - 6"	3 1/2" STD	4.000"	3.548"
20' - 10"	4" STD	4.500"	4.026"
35' - 4"	5" STD	5.563"	5.047"

PIPE I.D.	MINIMUM WALL THICKNESS	MINIMUM O.D.	MIN O.D. AT TAPERED END	MIN REINF REQUIREMENTS (S _a in/ft of pipe)	SLOPE	MINIMUM LENGTH OF UNIT	SINGLE PIPE		MULTIPLE PIPE	
							SKIEW	PIPE RUNNERS REQUIRED	SKIEW	PIPE RUNNERS REQUIRED
12"	2"	16"	16"	0.07 CIRC.	3:1	2'-0"	<=45 deg	No	<=45 deg	No
						2'-8"				
						4'-0"				
15"	2 1/4"	19 1/2"	19"	0.07 CIRC.	3:1	2'-10"	<=45 deg	No	<=45 deg	No
						3'-9"				
						5'-8"				
18"	2 1/2"	23"	21 1/2"	0.07 CIRC.	3:1	3'-8"	<=45 deg	No	<=45 deg	No
						4'-10"				
						7'-3"				
24"	3"	30"	27"	0.07 CIRC.	3:1	5'-3"	<=45 deg	No	<=30 deg	No
						7'-0"			>30 deg	Yes
						10'-6"				
30"	3 1/2"	37"	31"	0.18 CIRC.	3:1	6'-3"	<=15 deg	No	<=15 deg	No
						8'-2"			>15 deg	Yes
						12'-1"				
36"	4"	44"	36"	0.19 ELIP.	3:1	7'-10"	=0 deg	No	=>0 deg	Yes
						10'-4"			>0 deg	Yes
						15'-4"				
42"	4 1/2"	51"	41 1/2"	0.23 ELIP.	3:1	9'-6"	=>0 deg	Yes	=>0 deg	Yes
						12'-6"				
						18'-7"				

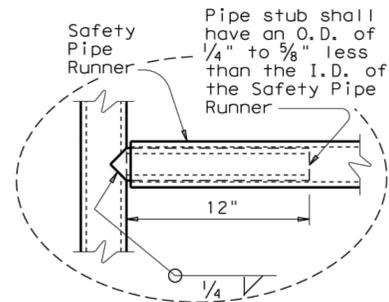


PLAN VIEW

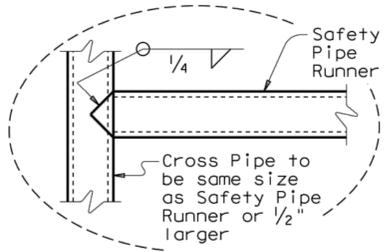


LONGITUDINAL ELEVATION

- Slope as shown elsewhere in the plans. Slope of 3:1 or flatter is required for vehicle safety.
- Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the Safety End Treatment backfill shall be as directed by Engineer.
- The top 4" of void between Precast End Treatments shall be filled with concrete Riprap and shall be considered subsidiary to Safety End Treatment.
- Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.

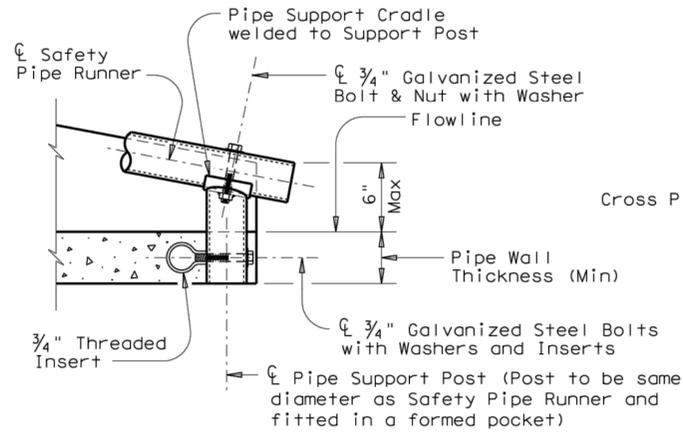


OPTION A



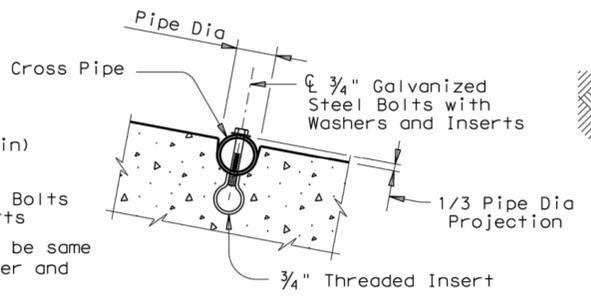
OPTION B

DETAIL A



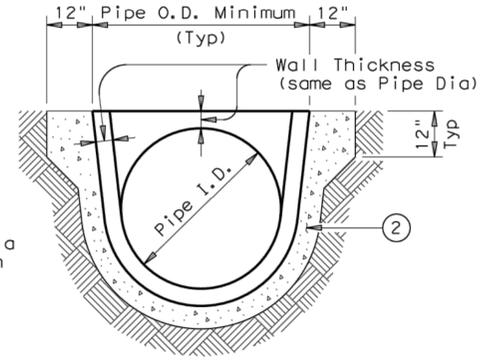
END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

(If required)

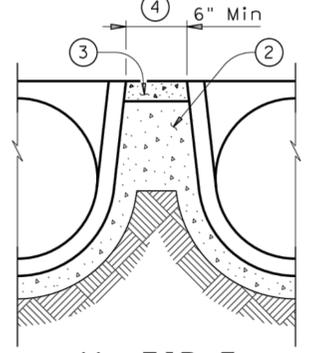


INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)



SECTION A-A



MULTIPLE PIPE INSTALLATION

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment". When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans.

Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise.

All precast concrete end sections shall be manufactured in accordance with Item "Reinforced Concrete Pipe" and in accordance with ASTM Specification C-76, Class III, Wall B for circular pipe.

Precast concrete end sections shall be provided with a spigot or bell end for compatibility to upstream or downstream end conditions with sufficient annular space to allow for mortar, cold applied asphalt joint compound or pre-formed plastic gasket material.

Methods of lifting shall be provided by the manufacturer for ease of loading, unloading and installation.

Pipe Runners are designed for a traversing load of 1,800 Lbs at yield as recommended by Research Report 280-1, "Safety Treatment of Roadside Cross-Drainage Structures", Texas Transportation Institute, March 1981.

Safety Pipe Runners, Cross Pipes, Pipe Support Posts, and Pipe Support Cradles shall conform to the requirements of ASTM A53 (Type E or S, Grade B), ASTM A500 (Grade B), or API 5LX52.

All steel components except reinforcing, shall be galvanized in accordance with the specifications. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

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Texas Department of Transportation Bridge Division Standard

PRECAST SAFETY END TREATMENT TYPE II ~ CROSS DRAINAGE

PSET-RC

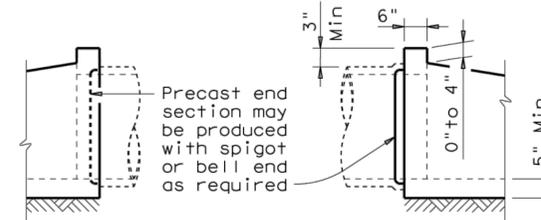
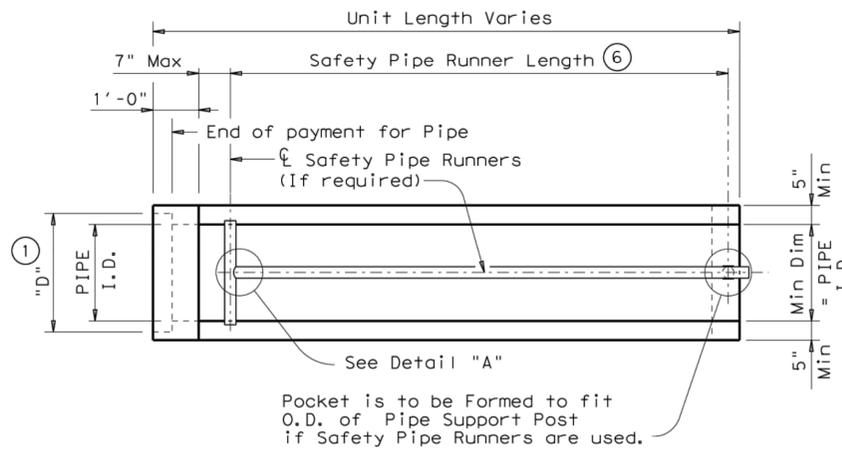
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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.

DATE: FILE:

\\MSA-SERVER31P\DRIVE\PROJECTS\15454008\CAD\30-SHEET\SLV234 - C - TXDOT - PSETRC - 0001.DWG

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PIPE I. D.	PIPE WALL "B" THICKNESS	"D"	SLOPE	MINIMUM LENGTH OF UNIT	SINGLE PIPE		MULTIPLE PIPE	
					SKEW	PIPE RUNNERS REQUIRED	SKEW	PIPE RUNNERS REQUIRED
12"	2"	17"	3:1	2'-11"	<=45 deg	No	<=45 deg	No
			4:1	3'-6"				
			6:1	4'-9"				
15"	2 1/4"	20 1/2"	3:1	3'-8"	<=45 deg	No	<=45 deg	No
			4:1	4'-7"				
			6:1	6'-5"				
18"	2 1/2"	24"	3:1	4'-6"	<=45 deg	No	<=45 deg	No
			4:1	5'-8"				
			6:1	8'-0"				
24"	3"	31"	3:1	6'-2"	<=45 deg	No	<=30 deg	No
			4:1	7'-10"			>30 deg	Yes
			6:1	11'-3"				
30"	3 1/2"	38 1/2"	3:1	7'-10"	<=15 deg	No	<=15 deg	No
			4:1	10'-1"				
			6:1	14'-8"				
36"	4"	45 1/2"	3:1	9'-5"	=0 deg	No	=>0 deg	Yes
			4:1	12'-3"				
			6:1	17'-11"				
42"	4 1/2"	52 1/2"	3:1	11'-1"	=>0 deg	Yes	=>0 deg	Yes
			4:1	14'-5"				
			6:1	21'-2"				

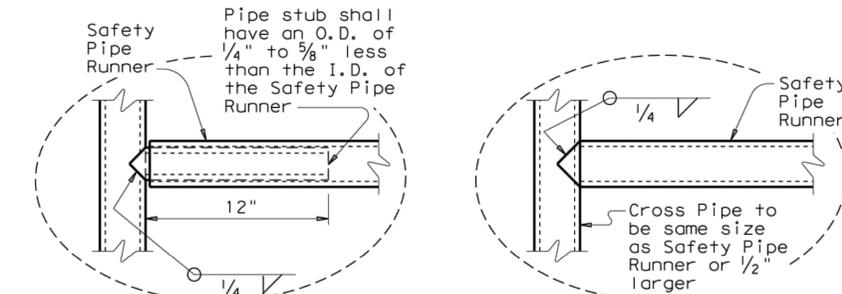
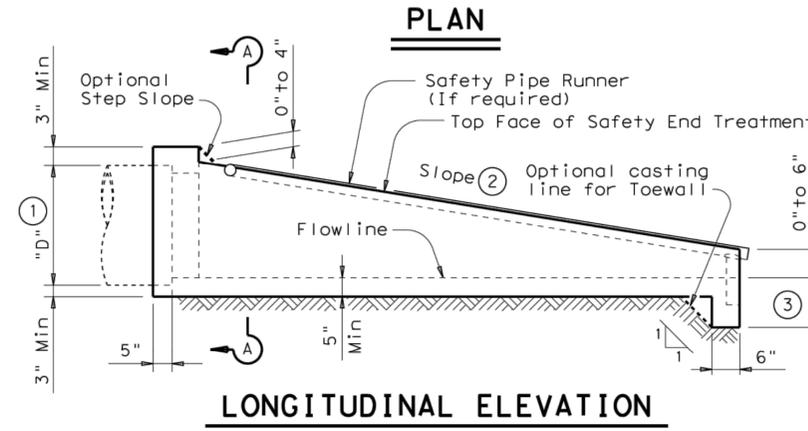


OPTIONAL JOINT

(Showing joint between RCP and Precast Safety End Treatment)

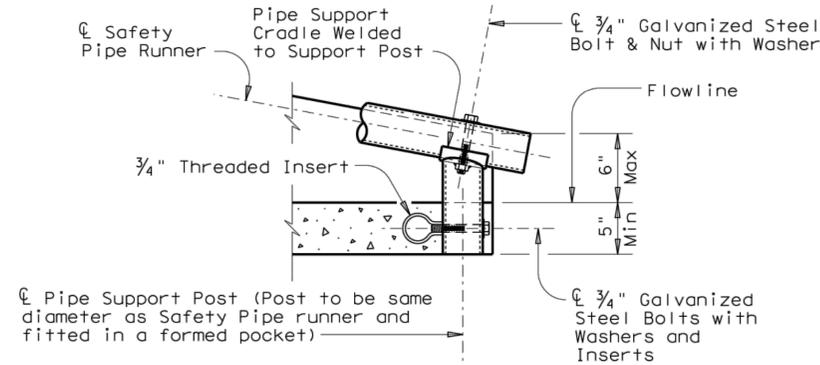
Maximum Safety Pipe Runner Length	Required Pipe Runner Size		
	Pipe Size	Pipe O.D.	Pipe I.D.
11'- 2"	3" STD	3.500"	3.068"
15'- 6"	3 1/2" STD	4.000"	3.548"
20'-10"	4" STD	4.500"	4.026"
35'- 4"	5" STD	5.563"	5.047"

- Dimension "D" is based on ASTM C-76, Class III, Wall thickness "B". If any other wall thickness is used, dimension "D" must be adjusted accordingly.
- Slope as shown elsewhere in plans. Slope of 3:1 or flatter is required for vehicle safety.
- Toewall to be used only when dimension is shown elsewhere in the plans.
- The top 4" of void between precast end treatments shall be filled with concrete riprap and shall be considered subsidiary to Safety End Treatment.
- Clear distance between pipes shall be adjusted to provide for the minimum distance between safety end treatments.
- Measured along Slope.
- Cement stabilized bedding and backfill shall be in accordance with the Item, "Excavation and Backfill for Structures". Bedding and backfill shall be considered subsidiary to the Item "Safety End Treatment". When concrete riprap is specified around the safety end treatment, backfill shall be as directed by Engineer.



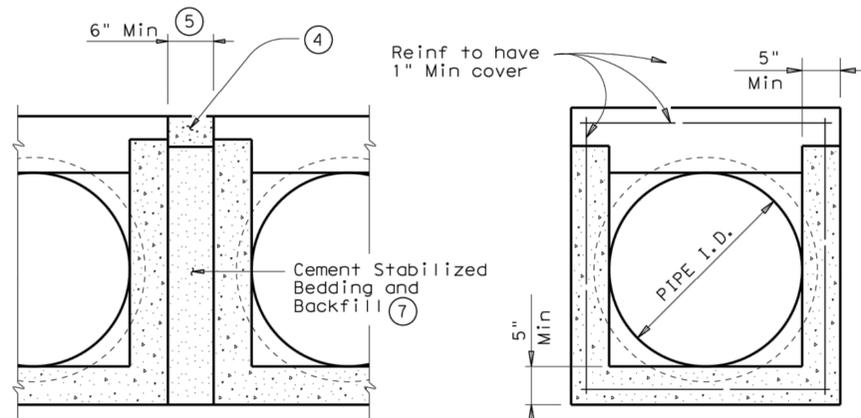
OPTION A DETAIL A OPTION B

(If required)



END DETAIL FOR INSTALLATION OF SAFETY PIPE RUNNERS

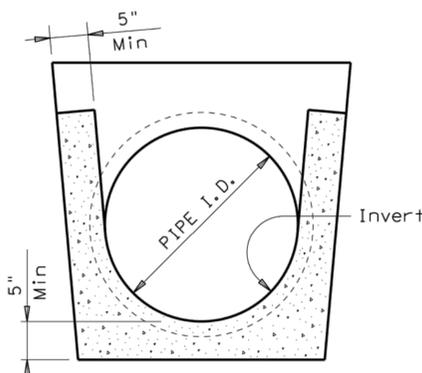
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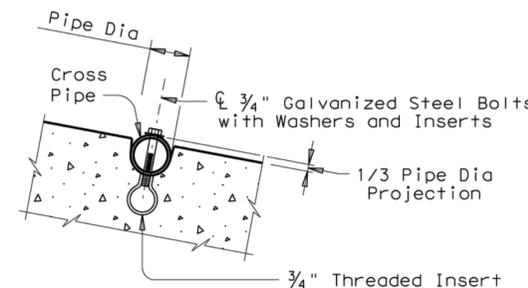
MULTIPLE PIPE INSTALLATION

OPTION WITH SQUARE BOTTOM

SECTION A-A



OPTION WITH INVERT BOTTOM



INSTALLATION DETAIL FOR SAFETY PIPE RUNNERS

(If required)

GENERAL NOTES:

Precast safety end treatment for reinforced concrete pipe may be used for TYPE II end treatment as specified in Item "Safety End Treatment". When Precast Safety End Treatment is used as a Contractor's alternate to mitered RCP, Riprap will not be required unless noted otherwise on the plans. Synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) may be used in lieu of steel reinforcing in riprap concrete unless noted otherwise. Manufacture of this product shall conform to requirements of Item "Safety End Treatment" except as noted below:
 A. Minimum reinforcing shall be #4 at 6" (Grade 40) or #4 at 9" (Grade 60) each way or 6 x 6 - W12 x W12 or 5 x 5 - W10 x W10 welded wire reinforcement (WWR).
 B. Concrete for precast (steel formed) sections shall be Class "C" with a minimum compressive strength of 3600 psi.
 At the option and expense of the Contractor the next larger size of Safety End Treatment may be furnished; as long as the "D" dimension cast is that of the required size of pipe. Pipe Runners are designed for a traversing load of 1,800 lbs as recommended by Research Report 280-1, "Safety Treatment of Cross-Drainage Structures", Texas Transportation Institute, MO. Safety Pipe Runners, Cross Pipes, Pipe Support Posts, and Pipe shall conform to the requirements of ASTM A53 (Type E or S, Grade B), or API 5LX52. All steel components except reinforcing, shall be galvanized fabrication. Galvanizing damaged during transport or construction shall be repaired in accordance with the specifications.

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Texas Department of Transportation Bridge Division Standard

PRECAST SAFETY END TREATMENT TYPE II ~ CROSS DRAINAGE

PSET-SC

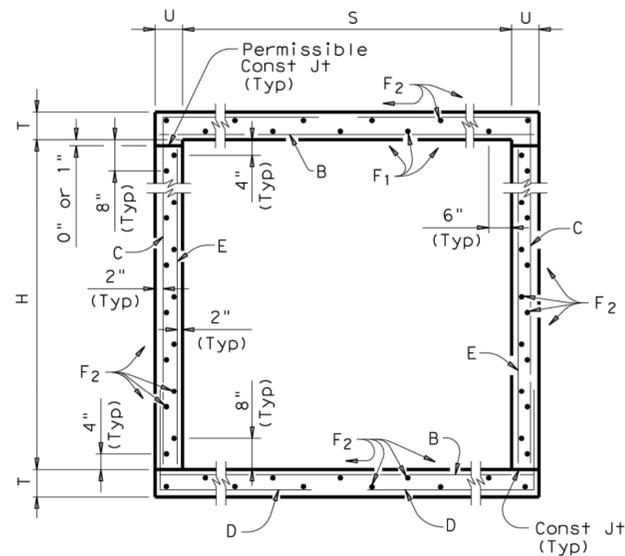
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©TxDOT February 2010	CONT	SECT	JOB	HIGHWAY
REVISIONS				
11-10: Add note for synthetic fibers.	DIST	COUNTY		SHEET NO.

\\MSA-SERVER31P\DRIVE\PROJECTS\15454008\CAD\30-SHEET\SLV234 - C - TXDOT - PSETS-SC - 0001.DWG

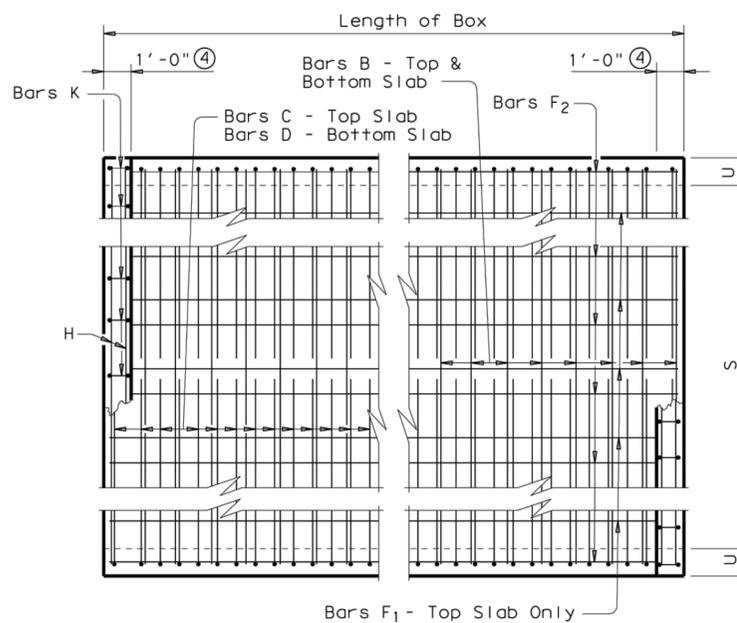
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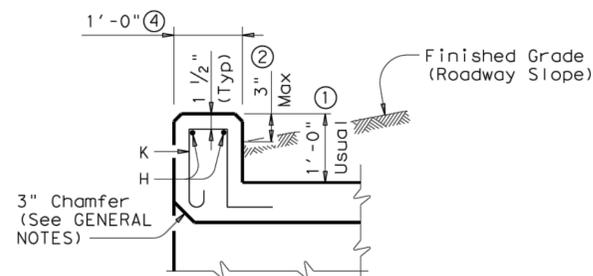
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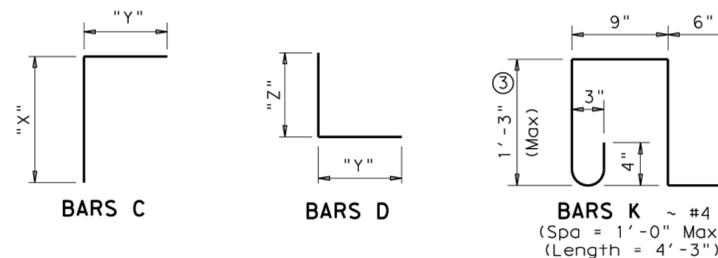
TYPICAL SECTION



PLAN OF REINF STEEL



SECTION THRU CURB



- ① 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 bridge rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- ② For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
 - For structures with bridge rail, curbs shall be flush with finished grade.
 Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- ③ For curbs less than 1'-0" high, tilt bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, bars K may be omitted.
- ④ 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
 $WWR \text{ required} = (0.44 \text{ sq in} / 0.5') \times (60 \text{ ksi} / 70 \text{ ksi}) = 0.754 \text{ sq in/ft}$
 If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = $(0.306 \text{ sq in} / 0.754 \text{ sq in/ft}) \times 12 \text{ in/ft} = 4.87" \text{ Max spacing}$.
 Required lap length for the provided D30.6 wire is 2'-2" (Lap required for uncoated No. 5 bars, as shown in Item 440).

GENERAL NOTES:

Designed according to AASHTO LRFD Specifications.
 Designed to the maximum fill height shown.
 All reinforcing steel shall be Grade 60.
 All concrete shall be Class "C" with these exceptions: use Class "S" for top slabs of culverts with overlay, with 1-to-2 course surface treatment, or with the top slab as the final riding surface.
 Class "C" concrete shall have a minimum compressive strength of 3,600 psi. Class "S" concrete shall have a minimum compressive strength of 4,000 psi.
 The use of permanent forms is not allowed.
 The bottom edge of the top slab shall be chamfered 3" at the entrance.
 Reinforcing bars shall be adjusted to minimum of 1 1/4" clear cover.
 Construction joints shown at the flow raised a maximum of 6" at the Contractor's option. If this option is used, Bars E may be raised, and Bars C and D may be reverse.
 See standard SCC-MD for skewed ends, and lengthening details.

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HL93 LOADING

SHEET 1 OF 2



SINGLE BOX CULVERTS CAST-IN-PLACE 0' TO 30' FILL

SCC-8

FILE: scc08ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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REVISIONS				
10-12: Added WWR	DIST	COUNTY	SHEET NO.	

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DATE: FILE:

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SECTION DIMENSIONS				FILL HEIGHT ⑤	BILLS OF REINFORCING STEEL (For Box Length = 40 feet)																				QUANTITIES																		
					Bars B					Bars C					Bars D					Bars E~#4 at 18" Max		Bars F1~#4		Bars F2~#4 at 18" Max		Bars H 4~#4		Bars K		Per foot of Barrel		Curb		Total									
S	H	T	U	No.	Size	Spd	Length	Weight	No.	Size	Spd	Length	Weight	"X"	"Y"	No.	Size	Spd	Length	Weight	"Y"	"Z"	No.	Length	Wt	No.	Spd	Length	Wt	No.	Length	Wt	Length	Wt	No.	Wt	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	Conc (CY)	Reinf (Lb)	
8'-0"	4'-0"	7"	7"	13'	162	#6	6"	8'-11"	2,170	194	#5	5"	8'-8"	1,754	4'-5"	4'-3"	194	#5	5"	6'-10"	1,383	4'-3"	2'-7"	56	4'-0"	150	13	7"	39'-9"	345	32	39'-9"	850	8'-11"	24	20	57	0.569	166.3	0.7	81	23.5	6,733
8'-0"	4'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	8'-9"	1,770	4'-6"	4'-3"	194	#5	5"	6'-11"	1,400	4'-3"	2'-8"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	8'-11"	24	20	57	0.626	173.2	0.7	81	25.7	7,008
8'-0"	4'-0"	9"	8"	20'	194	#6	5"	9'-1"	2,647	194	#5	5"	8'-10"	1,787	4'-7"	4'-3"	194	#5	5"	7'-0"	1,416	4'-3"	2'-9"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	9'-1"	24	22	62	0.716	175.2	0.7	86	29.3	7,095
8'-0"	4'-0"	10"	8"	23'	194	#6	5"	9'-1"	2,647	138	#6	7"	8'-11"	1,848	4'-8"	4'-3"	138	#6	7"	7'-6"	1,555	4'-3"	3'-3"	56	4'-0"	150	6	18"	39'-9"	159	32	39'-9"	850	9'-1"	24	22	62	0.774	180.2	0.7	86	31.7	7,295
8'-0"	4'-0"	11"	9"	30'	162	#7	6"	9'-3"	3,063	194	#5	5"	9'-0"	1,821	4'-9"	4'-3"	194	#5	5"	7'-2"	1,450	4'-3"	2'-11"	56	4'-0"	150	6	18"	39'-9"	159	34	39'-9"	903	9'-3"	25	22	62	0.867	188.7	0.7	87	35.4	7,633
8'-0"	5'-0"	7"	7"	13'	162	#6	6"	8'-11"	2,170	194	#5	5"	9'-8"	1,956	5'-5"	4'-3"	194	#5	5"	6'-10"	1,383	4'-3"	2'-7"	56	5'-0"	187	13	7"	39'-9"	345	36	39'-9"	956	8'-11"	24	20	57	0.612	174.9	0.7	81	25.2	7,078
8'-0"	5'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	9'-9"	1,973	5'-6"	4'-3"	194	#5	5"	6'-11"	1,400	4'-3"	2'-8"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	8'-11"	24	20	57	0.669	181.8	0.7	81	27.5	7,354
8'-0"	5'-0"	9"	8"	20'	194	#6	5"	9'-1"	2,647	194	#5	5"	9'-10"	1,990	5'-7"	4'-3"	194	#5	5"	7'-0"	1,416	4'-3"	2'-9"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	9'-1"	24	22	62	0.765	183.9	0.7	86	31.3	7,441
8'-0"	5'-0"	10"	8"	23'	194	#6	5"	9'-1"	2,647	194	#5	5"	9'-11"	2,007	5'-8"	4'-3"	194	#5	5"	7'-1"	1,433	4'-3"	2'-10"	56	5'-0"	187	6	18"	39'-9"	159	36	39'-9"	956	9'-1"	24	22	62	0.823	184.7	0.7	86	33.6	7,475
8'-0"	5'-0"	11"	9"	30'	194	#7	5"	9'-3"	3,668	194	#5	5"	10'-0"	2,023	5'-9"	4'-3"	194	#5	5"	7'-2"	1,450	4'-3"	2'-11"	56	5'-0"	187	6	18"	39'-9"	159	38	39'-9"	1,009	9'-3"	25	22	62	0.923	212.4	0.7	87	37.6	8,583
8'-0"	6'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	162	#5	6"	10'-8"	1,802	6'-5"	4'-3"	162	#5	6"	6'-10"	1,155	4'-3"	2'-7"	56	6'-0"	224	13	7"	39'-9"	345	40	39'-9"	1,062	8'-11"	24	20	57	0.655	179.7	0.7	81	26.9	7,267
8'-0"	6'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	10'-9"	2,175	6'-6"	4'-3"	194	#5	5"	6'-11"	1,400	4'-3"	2'-8"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	57	0.712	190.5	0.7	81	29.2	7,699
8'-0"	6'-0"	9"	8"	20'	194	#6	5"	9'-1"	2,647	194	#5	5"	10'-10"	2,192	6'-7"	4'-3"	194	#5	5"	7'-0"	1,416	4'-3"	2'-9"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	62	0.815	192.5	0.7	86	33.3	7,786
8'-0"	6'-0"	10"	8"	23'	194	#6	5"	9'-1"	2,647	194	#5	5"	10'-11"	2,209	6'-8"	4'-3"	194	#5	5"	7'-1"	1,433	4'-3"	2'-10"	56	6'-0"	224	6	18"	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	62	0.872	193.4	0.7	86	35.6	7,820
8'-0"	6'-0"	11"	9"	30'	194	#7	5"	9'-3"	3,668	194	#5	5"	11'-0"	2,226	6'-9"	4'-3"	194	#5	5"	7'-2"	1,450	4'-3"	2'-11"	56	6'-0"	224	6	18"	39'-9"	159	42	39'-9"	1,115	9'-3"	25	22	62	0.978	221.1	0.7	87	39.8	8,929
8'-0"	7'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	194	#5	5"	11'-8"	2,361	7'-5"	4'-3"	194	#5	5"	6'-10"	1,383	4'-3"	2'-7"	56	7'-0"	262	13	7"	39'-9"	345	40	39'-9"	1,062	8'-11"	24	20	57	0.699	200.3	0.7	81	28.7	8,092
8'-0"	7'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	11'-9"	2,378	7'-6"	4'-3"	194	#5	5"	6'-11"	1,400	4'-3"	2'-8"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	8'-11"	24	20	57	0.755	196.5	0.7	81	30.9	7,940
8'-0"	7'-0"	9"	8"	20'	194	#6	5"	9'-1"	2,647	194	#5	5"	11'-10"	2,394	7'-7"	4'-3"	194	#5	5"	7'-0"	1,416	4'-3"	2'-9"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	62	0.864	198.5	0.7	86	35.3	8,026
8'-0"	7'-0"	10"	8"	23'	162	#7	6"	9'-1"	3,008	194	#5	5"	11'-11"	2,411	7'-8"	4'-3"	194	#5	5"	7'-1"	1,433	4'-3"	2'-10"	56	7'-0"	262	6	18"	39'-9"	159	40	39'-9"	1,062	9'-1"	24	22	62	0.922	208.4	0.7	86	37.6	8,421
8'-0"	7'-0"	11"	9"	30'	194	#7	5"	9'-3"	3,668	194	#5	5"	12'-0"	2,428	7'-9"	4'-3"	194	#5	5"	7'-2"	1,450	4'-3"	2'-11"	56	7'-0"	262	6	18"	39'-9"	159	42	39'-9"	1,115	9'-3"	25	22	62	1.034	227.1	0.7	87	42.1	9,169
8'-0"	8'-0"	7"	7"	13'	194	#6	5"	8'-11"	2,598	194	#5	5"	12'-8"	2,563	8'-5"	4'-3"	194	#5	5"	6'-10"	1,383	4'-3"	2'-7"	56	8'-0"	299	13	7"	39'-9"	345	44	39'-9"	1,168	8'-11"	24	20	57	0.742	208.9	0.7	81	30.4	8,437
8'-0"	8'-0"	8"	7"	16'	194	#6	5"	8'-11"	2,598	194	#5	5"	12'-9"	2,580	8'-6"	4'-3"	194	#5	5"	6'-11"	1,400	4'-3"	2'-8"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	8'-11"	24	20	57	0.798	205.1	0.7	81	32.6	8,285
8'-0"	8'-0"	9"	8"	20'	194	#6	5"	9'-1"	2,647	194	#5	5"	12'-10"	2,597	8'-7"	4'-3"	194	#5	5"	7'-0"	1,416	4'-3"	2'-9"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	9'-1"	24	22	62	0.914	207.2	0.7	86	37.3	8,372
8'-0"	8'-0"	10"	8"	23'	162	#7	6"	9'-1"	3,008	194	#5	5"	12'-11"	2,614	8'-8"	4'-3"	194	#5	5"	7'-1"	1,433	4'-3"	2'-10"	56	8'-0"	299	6	18"	39'-9"	159	44	39'-9"	1,168	9'-1"	24	22	62	0.971	217.0	0.7	86	39.5	8,767
8'-0"	8'-0"	11"	9"	30'	194	#7	5"	9'-3"	3,668	194	#5	5"	13'-0"	2,630	8'-9"	4'-3"	194	#5	5"	7'-2"	1,450	4'-3"	2'-11"	56	8'-0"	299	6	18"	39'-9"	159	46	39'-9"	1,221	9'-3"	25	22	62	1.090	235.7	0.7	87	44.3	9,514

⑤ For each box size, minimum fill height shown shall be used for all culverts with less than 2'-0" of fill.

Deformed welded wire reinforcement (WWR) meeting the requirements of ASTM A1064 may be used to replace conventional reinforcement shown at the Contractor's option. The area of required reinforcement may be reduced by the ratio of 60 ksi / 70 ksi. Spacing of WWR is limited to 4" Min and 18" Max. When required, provide lap splices in the WWR of the same length required for the equivalent bar size, rounded up for wire sizes between conventional bar sizes.

Example Conversion: Replacement of No. 6 Gr 60 at 6" Spacing with WWR.
 WWR required = (0.44 sq in/ 0.5') x (60 ksi/70 ksi) = 0.754 sq in/ft.
 If D30.6 wire is used to meet the 0.754 sq in/ft requirement in this example, the required spacing = (0.306 sq in/ 0.754 sq in/ft) x 12 in/ft = 4.8" Max spacing.
 Required lap length for the provided D30.6 w 2'-2" (Lap required for uncoated No. 5 bars, shown in Item 440).

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HL93 LOADING SHEET 2 OF 2


Bridge Division Standard

**SINGLE BOX CULVERTS
CAST-IN-PLACE
0' TO 30' FILL**

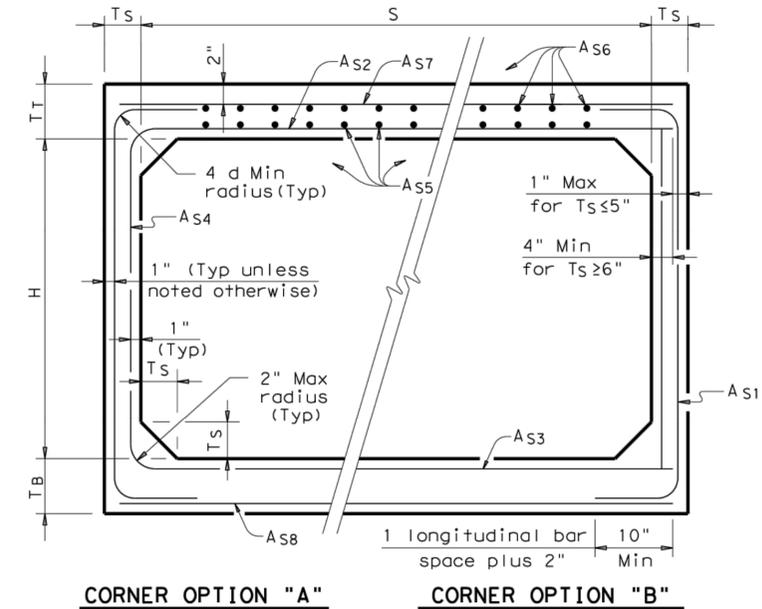
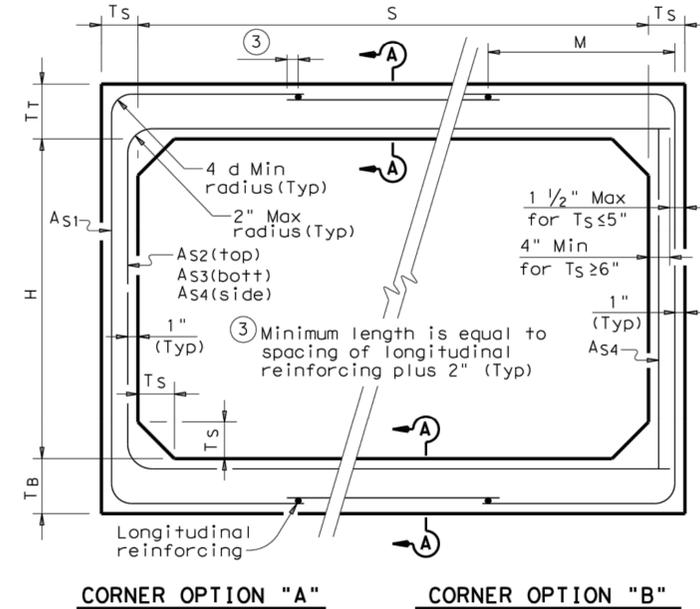
SCC-8

FILE: scc08ste.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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REVISIONS				
10-12: Added WWR	DIST	COUNTY	SHEET NO.	

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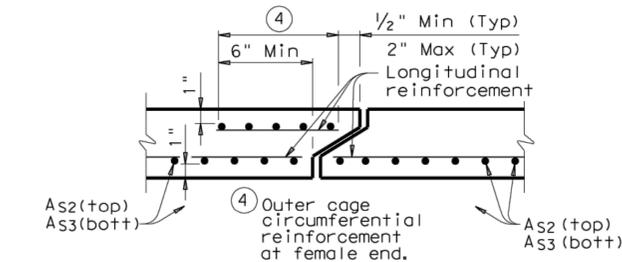
BOX DATA

SECTION DIMENSIONS					Fill Height (ft)	M (Min) (in)	REINFORCING (in ² /ft) ^②								Lift Weight (Tons) ^①
S (ft)	H (ft)	T _T (in)	T _B (in)	T _S (in)			A _{S1}	A _{S2}	A _{S3}	A _{S4}	A _{S5}	A _{S6}	A _{S7}	A _{S8}	
5	3	8	7	6	<2	-	0.19	0.31	0.21	0.14	0.19	0.19	0.19	0.17	6.6
5	3	6	6	6	2<3	45	0.18	0.24	0.19	0.14	-	-	-	-	5.7
5	3	6	6	6	3-5	36	0.14	0.17	0.16	0.14	-	-	-	-	5.7
5	3	6	6	6	10	36	0.14	0.16	0.17	0.14	-	-	-	-	5.7
5	3	6	6	6	15	35	0.16	0.21	0.22	0.14	-	-	-	-	5.7
5	3	6	6	6	20	35	0.21	0.27	0.28	0.14	-	-	-	-	5.7
5	3	6	6	6	25	35	0.26	0.34	0.34	0.14	-	-	-	-	5.7
5	3	6	6	6	30	35	0.31	0.41	0.41	0.14	-	-	-	-	5.7
5	4	8	7	6	<2	-	0.19	0.33	0.24	0.14	0.19	0.19	0.19	0.17	7.2
5	4	6	6	6	2<3	45	0.16	0.27	0.22	0.14	-	-	-	-	6.3
5	4	6	6	6	3-5	45	0.14	0.19	0.18	0.14	-	-	-	-	6.3
5	4	6	6	6	10	36	0.14	0.18	0.18	0.14	-	-	-	-	6.3
5	4	6	6	6	15	35	0.14	0.23	0.24	0.14	-	-	-	-	6.3
5	4	6	6	6	20	35	0.17	0.30	0.31	0.14	-	-	-	-	6.3
5	4	6	6	6	25	35	0.21	0.37	0.38	0.14	-	-	-	-	6.3
5	4	6	6	6	30	35	0.25	0.44	0.45	0.14	-	-	-	-	6.3
5	5	8	7	6	<2	-	0.19	0.35	0.26	0.14	0.19	0.19	0.19	0.17	7.8
5	5	6	6	6	2<3	45	0.14	0.29	0.24	0.14	-	-	-	-	6.9
5	5	6	6	6	3-5	45	0.14	0.21	0.20	0.14	-	-	-	-	6.9
5	5	6	6	6	10	45	0.14	0.19	0.20	0.14	-	-	-	-	6.9
5	5	6	6	6	15	36	0.14	0.24	0.25	0.14	-	-	-	-	6.9
5	5	6	6	6	20	35	0.15	0.31	0.32	0.14	-	-	-	-	6.9
5	5	6	6	6	25	35	0.18	0.38	0.39	0.14	-	-	-	-	6.9
5	5	6	6	6	30	35	0.21	0.46	0.47	0.14	-	-	-	-	6.9
5	2	8	7	6	<2	-	0.20	0.31	0.20	0.14	0.22	0.19	0.19	0.17	6.0
5	2	6	6	6	30	44	0.39	0.33	0.34	0.14	-	-	-	-	5.1



FILL HEIGHT 2 FT AND GREATER

FILL HEIGHT LESS THAN 2 FT



**SECTION A-A
(TOP AND BOTTOM SLAB
JOINT REINFORCEMENT)**

GENERAL NOTES:
 Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
 All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.
 See SCP-MD standard sheet for miscellaneous details and notes not shown.
 In lieu of furnishing the designs shown on this sheet, the contractor may furnish an alternate design that is equal to or exceeds the box design for the design fill height in the table. Shop plans for alternate designs shall be submitted in accordance with Item "Precast Concrete Structural Members (Fabrication)".

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① For Box Length = 8'-0"
 ② A_{S1} thru A_{S4}, A_{S7} and A_{S8} are minimum required areas of reinforcement per linear foot of box length. A_{S6} and A_{S5} are minimum required areas of reinforcement per linear foot of box width.
 ⑤ These designs were created by TxDOT and are not shown in the ASTM Specifications.

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

**SINGLE BOX CULVERTS
 PRECAST
 5'-0" SPAN**

SCP-5

FILE: scp05sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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REVISIONS	DIST	COUNTY	SHEET NO.	

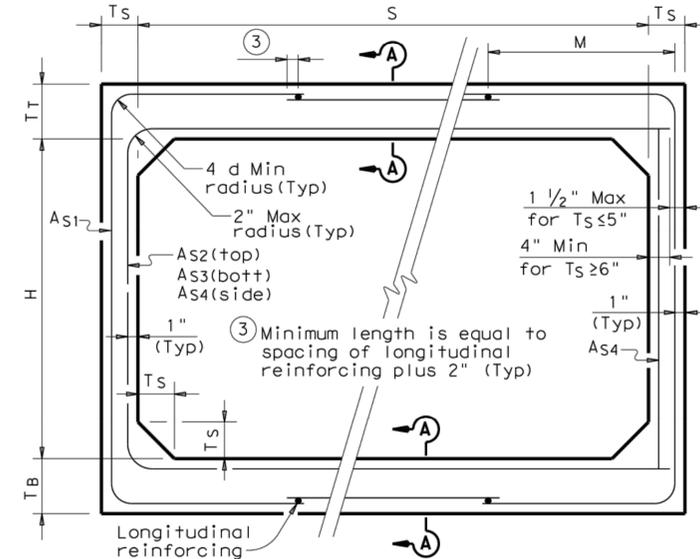
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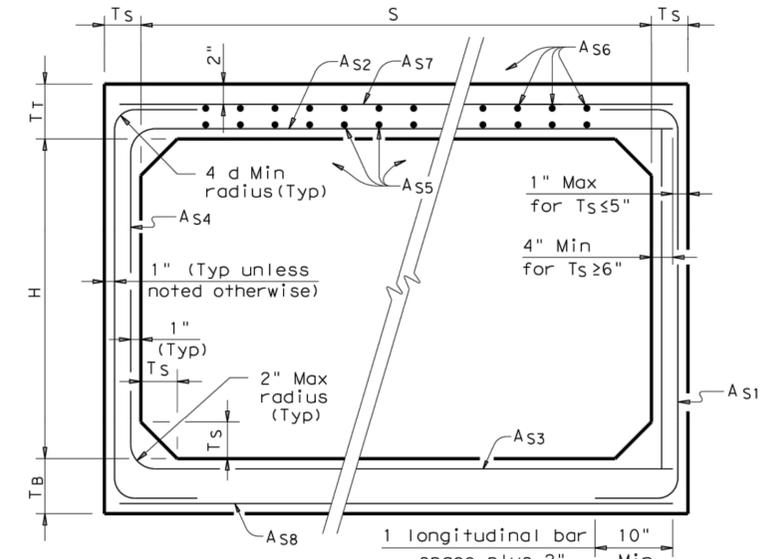
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BOX DATA

SECTION DIMENSIONS					Fill Height (ft)	M (Min) (in)	REINFORCING (in ² /ft) ^②								Lift Weight (Tons) ^①
S (ft)	H (ft)	T _T (in)	T _B (in)	T _S (in)			A _{S1}	A _{S2}	A _{S3}	A _{S4}	A _{S5}	A _{S6}	A _{S7}	A _{S8}	
8	4	8	8	8	<2	-	0.27	0.38	0.29	0.19	0.19	0.19	0.19	11.2	
8	4	8	8	8	2<3	50	0.31	0.34	0.32	0.19	-	-	-	11.2	
8	4	8	8	8	3-5	50	0.25	0.27	0.27	0.19	-	-	-	11.2	
8	4	8	8	8	10	45	0.26	0.28	0.29	0.19	-	-	-	11.2	
8	4	8	8	8	15	41	0.34	0.37	0.38	0.19	-	-	-	11.2	
8	4	8	8	8	20	41	0.44	0.48	0.49	0.19	-	-	-	11.2	
8	5	8	8	8	<2	-	0.24	0.40	0.32	0.19	0.19	0.19	0.19	12.0	
8	5	8	8	8	2<3	50	0.28	0.37	0.35	0.19	-	-	-	12.0	
8	5	8	8	8	3-5	45	0.23	0.29	0.30	0.19	-	-	-	12.0	
8	5	8	8	8	10	45	0.23	0.31	0.32	0.19	-	-	-	12.0	
8	5	8	8	8	15	41	0.30	0.41	0.42	0.19	-	-	-	12.0	
8	5	8	8	8	20	41	0.39	0.52	0.54	0.19	-	-	-	12.0	
8	6	8	8	8	<2	-	0.22	0.42	0.35	0.19	0.19	0.19	0.19	12.8	
8	6	8	8	8	2<3	50	0.25	0.40	0.38	0.19	-	-	-	12.8	
8	6	8	8	8	3-5	50	0.21	0.32	0.33	0.19	-	-	-	12.8	
8	6	8	8	8	10	45	0.22	0.33	0.34	0.19	-	-	-	12.8	
8	6	8	8	8	15	41	0.28	0.43	0.45	0.19	-	-	-	12.8	
8	6	8	8	8	20	41	0.36	0.55	0.57	0.19	-	-	-	12.8	
8	7	8	8	8	<2	-	0.20	0.44	0.37	0.19	0.19	0.19	0.19	13.6	
8	7	8	8	8	2<3	55	0.23	0.43	0.41	0.19	-	-	-	13.6	
8	7	8	8	8	3-5	55	0.19	0.34	0.35	0.19	-	-	-	13.6	
8	7	8	8	8	10	50	0.20	0.34	0.36	0.19	-	-	-	13.6	
8	7	8	8	8	15	41	0.26	0.45	0.47	0.19	-	-	-	13.6	
8	7	8	8	8	20	41	0.33	0.57	0.60	0.19	-	-	-	13.6	
8	8	8	8	8	<2	-	0.20	0.45	0.40	0.19	0.19	0.19	0.19	14.4	
8	8	8	8	8	2<3	65	0.21	0.45	0.44	0.19	-	-	-	14.4	
8	8	8	8	8	3-5	65	0.19	0.36	0.38	0.19	-	-	-	14.4	
8	8	8	8	8	10	55	0.19	0.35	0.38	0.19	-	-	-	14.4	
8	8	8	8	8	15	45	0.24	0.46	0.49	0.19	-	-	-	14.4	
8	8	8	8	8	20	45	0.31	0.59	0.62	0.19	-	-	-	14.4	



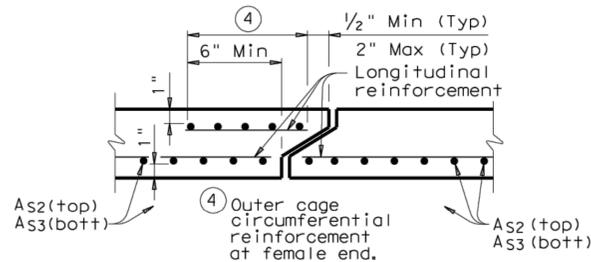
CORNER OPTION "A"



CORNER OPTION "B"

FILL HEIGHT 2 FT AND GREATER

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:
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① For Box Length = 8'-0"
 ② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS6 and AS5 are minimum required areas of reinforcement per linear foot of box width.

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

**SINGLE BOX CULVERTS
 PRECAST
 8'-0" SPAN**

SCP-8

FILE: scp08sts.dgn	DN: GAF	CK: LMW	DW: BWH/TxDOT	CK: GAF
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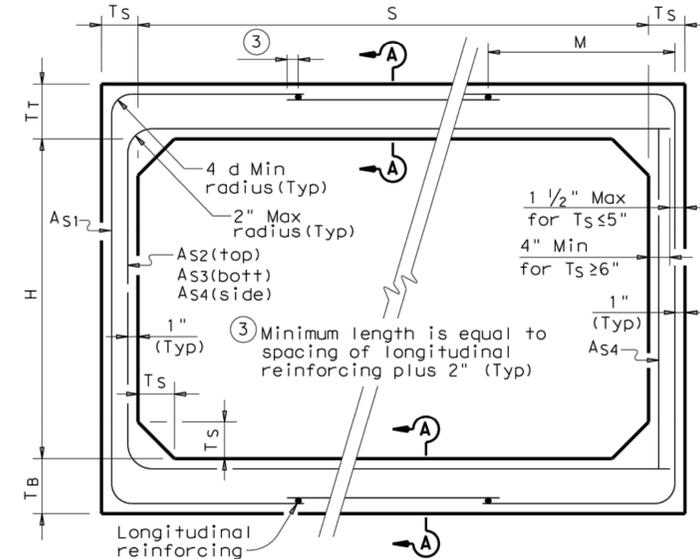
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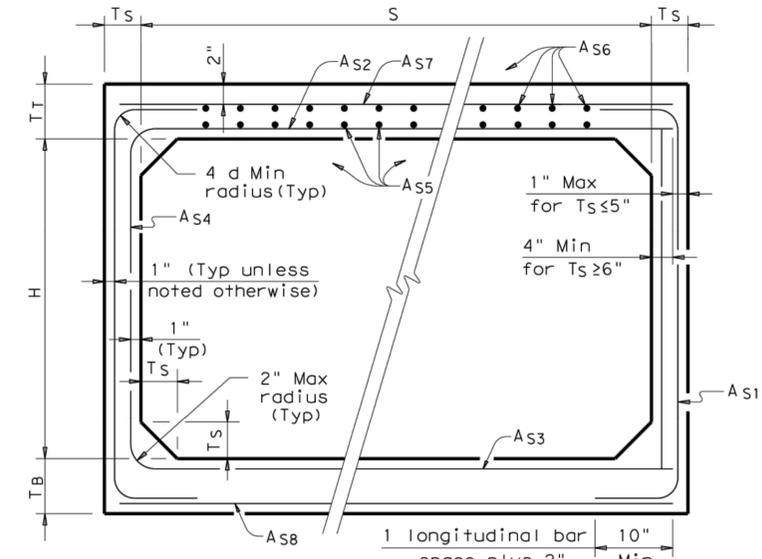
BOX DATA

SECTION DIMENSIONS					Fill Height (ft)	M (in)	REINFORCING (in ² /ft) ②								Lift Weight (Tons) ①
S (ft)	H (ft)	T _T (in)	T _B (in)	T _S (in)			A _{S1}	A _{S2}	A _{S3}	A _{S4}	A _{S5}	A _{S6}	A _{S7}	A _{S8}	
10	5	10	10	10	<2	-	0.30	0.36	0.30	0.24	0.24	0.24	0.24	0.24	17.5
10	5	10	10	10	2<3	58	0.35	0.39	0.34	0.24	-	-	-	-	17.5
10	5	10	10	10	3-5	53	0.28	0.31	0.30	0.24	-	-	-	-	17.5
10	5	10	10	10	10	52	0.33	0.35	0.36	0.24	-	-	-	-	17.5
10	5	10	10	10	15	47	0.42	0.46	0.47	0.24	-	-	-	-	17.5
10	5	10	10	10	20	47	0.55	0.59	0.61	0.24	-	-	-	-	17.5
10	5	10	10	10	25	47	0.68	0.73	0.75	0.24	-	-	-	-	17.5
10	6	10	10	10	<2	-	0.28	0.38	0.33	0.24	0.24	0.24	0.24	0.24	18.5
10	6	10	10	10	2<3	58	0.32	0.42	0.37	0.24	-	-	-	-	18.5
10	6	10	10	10	3-5	52	0.26	0.34	0.33	0.24	-	-	-	-	18.5
10	6	10	10	10	10	52	0.30	0.38	0.39	0.24	-	-	-	-	18.5
10	6	10	10	10	15	47	0.39	0.49	0.51	0.24	-	-	-	-	18.5
10	6	10	10	10	20	47	0.50	0.63	0.65	0.24	-	-	-	-	18.5
10	6	10	10	10	25	47	0.61	0.78	0.80	0.24	-	-	-	-	18.5
10	7	10	10	10	<2	-	0.25	0.40	0.36	0.24	0.24	0.24	0.24	0.24	19.5
10	7	10	10	10	2<3	58	0.30	0.45	0.40	0.24	-	-	-	-	19.5
10	7	10	10	10	3-5	58	0.24	0.36	0.35	0.24	-	-	-	-	19.5
10	7	10	10	10	10	52	0.28	0.40	0.42	0.24	-	-	-	-	19.5
10	7	10	10	10	15	47	0.36	0.52	0.54	0.24	-	-	-	-	19.5
10	7	10	10	10	20	47	0.46	0.67	0.69	0.24	-	-	-	-	19.5
10	7	10	10	10	25	47	0.56	0.82	0.85	0.24	-	-	-	-	19.5
10	8	10	10	10	<2	-	0.24	0.41	0.38	0.24	0.24	0.24	0.24	0.24	20.5
10	8	10	10	10	2<3	64	0.27	0.47	0.43	0.24	-	-	-	-	20.5
10	8	10	10	10	3-5	58	0.24	0.38	0.38	0.24	-	-	-	-	20.5
10	8	10	10	10	10	52	0.26	0.42	0.44	0.24	-	-	-	-	20.5
10	8	10	10	10	15	47	0.34	0.54	0.57	0.24	-	-	-	-	20.5
10	8	10	10	10	20	47	0.43	0.69	0.72	0.24	-	-	-	-	20.5
10	9	10	10	10	<2	-	0.24	0.42	0.41	0.24	0.24	0.24	0.24	0.24	21.5
10	9	10	10	10	2<3	70	0.26	0.50	0.46	0.24	-	-	-	-	21.5
10	9	10	10	10	3-5	64	0.24	0.40	0.40	0.24	-	-	-	-	21.5
10	9	10	10	10	10	58	0.25	0.43	0.46	0.24	-	-	-	-	21.5
10	9	10	10	10	15	52	0.32	0.56	0.59	0.24	-	-	-	-	21.5
10	9	10	10	10	20	47	0.40	0.71	0.75	0.24	-	-	-	-	21.5
10	10	10	10	10	<2	-	0.24	0.44	0.44	0.24	0.24	0.24	0.24	0.24	22.5
10	10	10	10	10	2<3	79	0.25	0.52	0.48	0.24	-	-	-	-	22.5
10	10	10	10	10	3-5	70	0.24	0.42	0.43	0.24	-	-	-	-	22.5
10	10	10	10	10	10	64	0.24	0.44	0.48	0.24	-	-	-	-	22.5
10	10	10	10	10	15	52	0.30	0.57	0.61	0.24	-	-	-	-	22.5
10	10	10	10	10	20	52	0.38	0.73	0.77	0.24	-	-	-	-	22.5



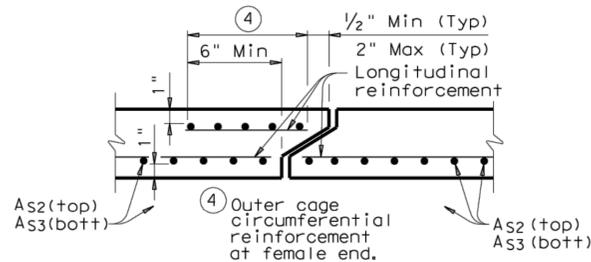
CORNER OPTION "A" **CORNER OPTION "B"**

FILL HEIGHT 2 FT AND GREATER



CORNER OPTION "A" **CORNER OPTION "B"**

FILL HEIGHT LESS THAN 2 FT



SECTION A-A

(TOP AND BOTTOM SLAB JOINT REINFORCEMENT)

GENERAL NOTES:
 Designs shown conform to ASTM C1577. Refer to ASTM C1577 for information or details not shown.
 All concrete shall be Class "H" Concrete with a minimum compressive strength of 5,000 psi.
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① For Box Length = 8'-0"
 ② AS1 thru AS4, AS7 and AS8 are minimum required areas of reinforcement per linear foot of box length. AS6 and AS5 are minimum required areas of reinforcement per linear foot of box width.

HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

**SINGLE BOX CULVERTS
 PRECAST
 10'-0" SPAN**

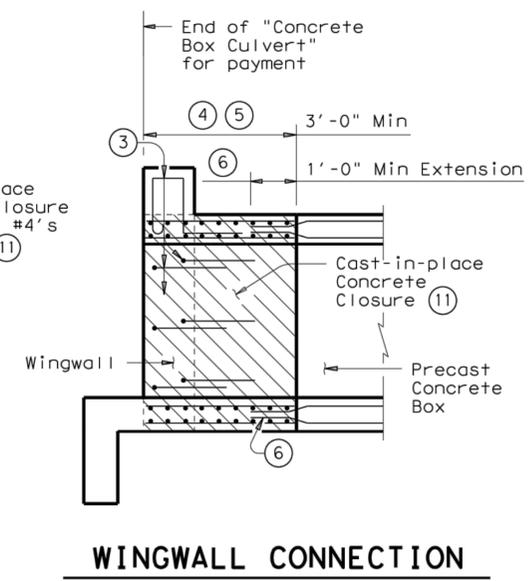
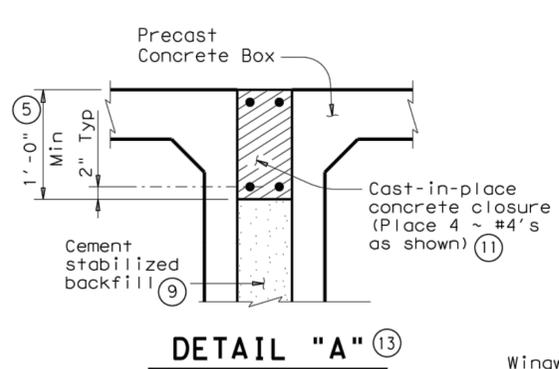
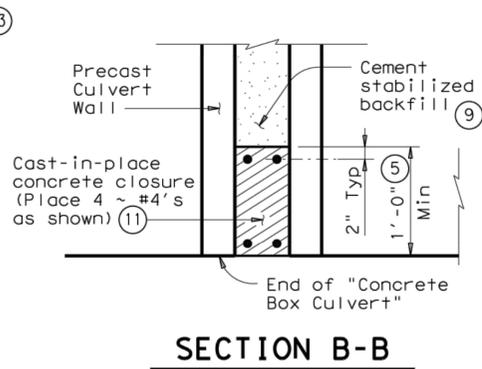
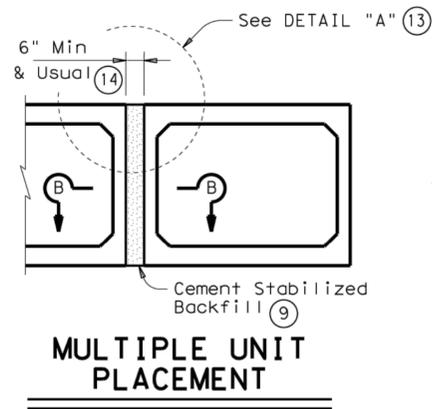
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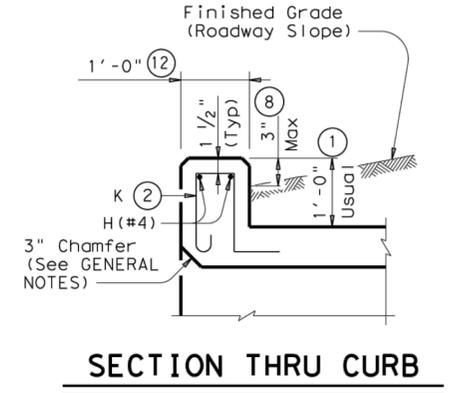
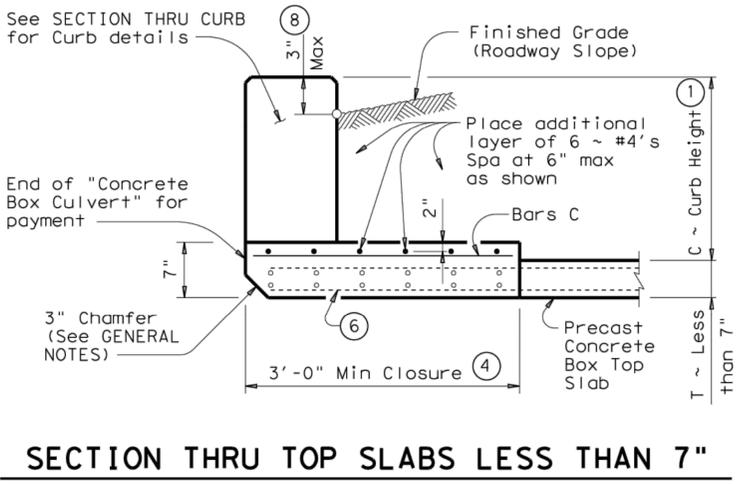
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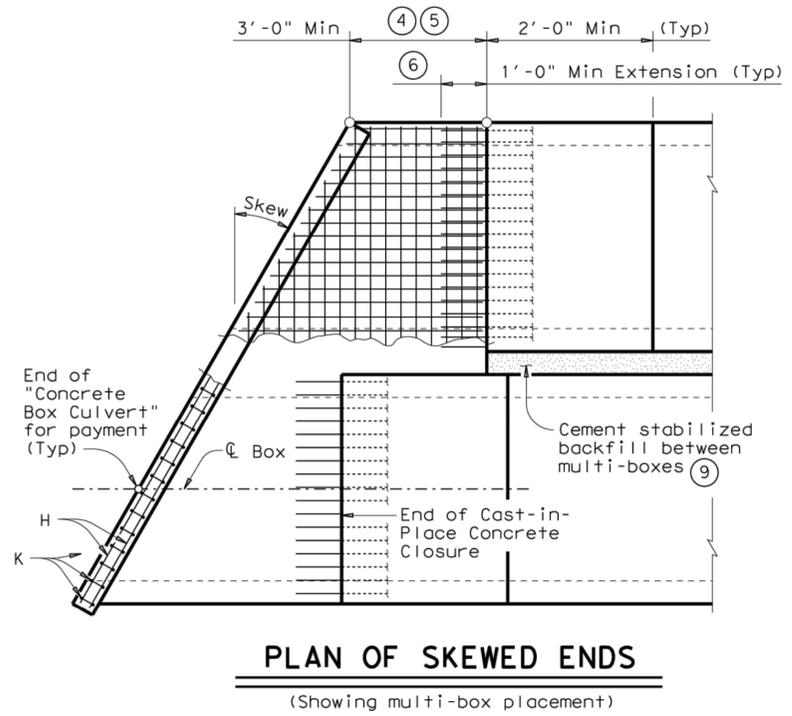
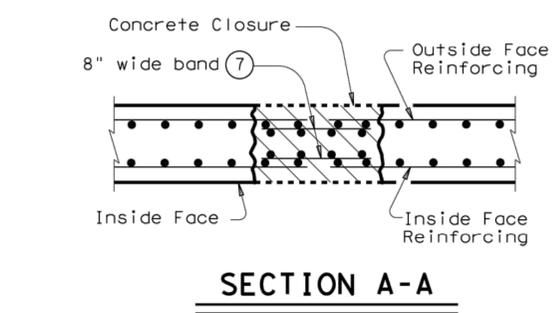
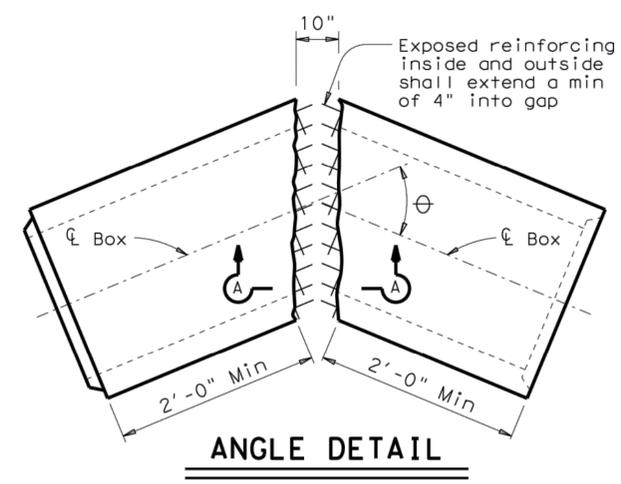
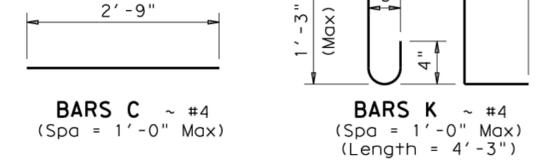


- 1 0" min to 5'-0" max. Estimated curb heights are shown elsewhere in the plans. For structures with pedestrian rail, bicycle rail or curbs taller than 1'-0", refer to ECD standard. For structures with T6 traffic rail, refer to T6-CM standard. For structures with traffic rail, other than T6, refer to RAC standard.
- 2 For curbs less than 1'-0" high, tilt Bars K or reduce bar height as necessary to maintain cover. For curbs less than 3" high, Bars K may be omitted.
- 3 Curb, Wingwall or Safety End Treatment reinforcing shall extend into concrete closure. Any reinforcing that does not fit into the closure shall be bent or trimmed as necessary.
- 4 Cast-in-place concrete closure shall be 3'-0" min. Boxes shall be cast short or broken back in the field. All reinforcing in the closure shall be the same size and spacing as in the precast box section. Except where shown otherwise, the cast-in-place closure shall be flush with the inside and outside faces of the precast box section.
- 5 For multiple unit placements the length of the closure for the interior walls may be adjusted as necessary. The length of the top slab, bottom slab, and exterior wall closure shall not be less than 3'-0". See Section B-B detail when interior walls are cast full length.
- 6 Precast box reinforcing shall extend a minimum of 1'-0" into concrete closure (Typ).
- 7 Bands of reinforcing matching the inside and outside face reinforcing shall be placed in the gaps of the top and bottom slabs. A band matching the outside face reinforcing of the wall shall be placed in the gaps of the walls (placed in the outside face only). The bands shall be tack welded to the exposed reinforcing at each point of contact.
- 8 For vehicle safety, the following requirements must be met:
 - For structures without bridge rail, curbs shall project no more than 3" above finished grade.
 - For structures with bridge rail, curbs shall be flush with finished grade.
 Curb heights shall be reduced, if necessary, to meet the above requirements. No changes will be made in quantities and no additional compensation will be allowed for this work.
- 9 Cement Stabilized Backfill between boxes is considered part of the Box Culvert for payment.
- 10 All curb concrete and reinforcing is considered part of the Box Culvert for payment.
- 11 Any additional concrete and reinforcing required for the closures shall be considered as subsidiary to the Concrete Box Culvert.
- 12 1'-0" typical. 2'-0" when RAC standard is referred to elsewhere in the plans.
- 13 For multiple unit placement with overlay, with 1 to 2 course surface treatment, or with the top slab as the final riding surface, provide wall closure as shown in DETAIL "A".
- 14 This dimension may be increased with approval of the Engineer to allow the precast boxes to be tunneled or jacked in accordance with Item 476, "Jacking, Boring, or Tunneling Pipe or Box". No payment will be made for any additional material in the gap between adjacent boxes.



(10) QUANTITIES PER FOOT OF CURB

Reinforcing Steel	4.18 Lb
Concrete	0.037 CY



GENERAL NOTES:
 Designed according to AASHTO LRFD Specifications.
 All closure concrete shall be Class "C" with a minimum compressive strength of 3600 psi and shall be placed according to the Item, "Concrete Substructures".
 Any additional concrete required for the closures shall be considered as subsidiary to the Concrete Box Culvert.
 Refer to the Single Box Culverts Precast standard for details not shown.
 The bottom edge of the top slab closure shall be chamfered 3 inches at the entrance.

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HL93 LOADING

Texas Department of Transportation
 Bridge Division Standard

BOX CULVERTS PRECAST MISCELLANEOUS DETAILS

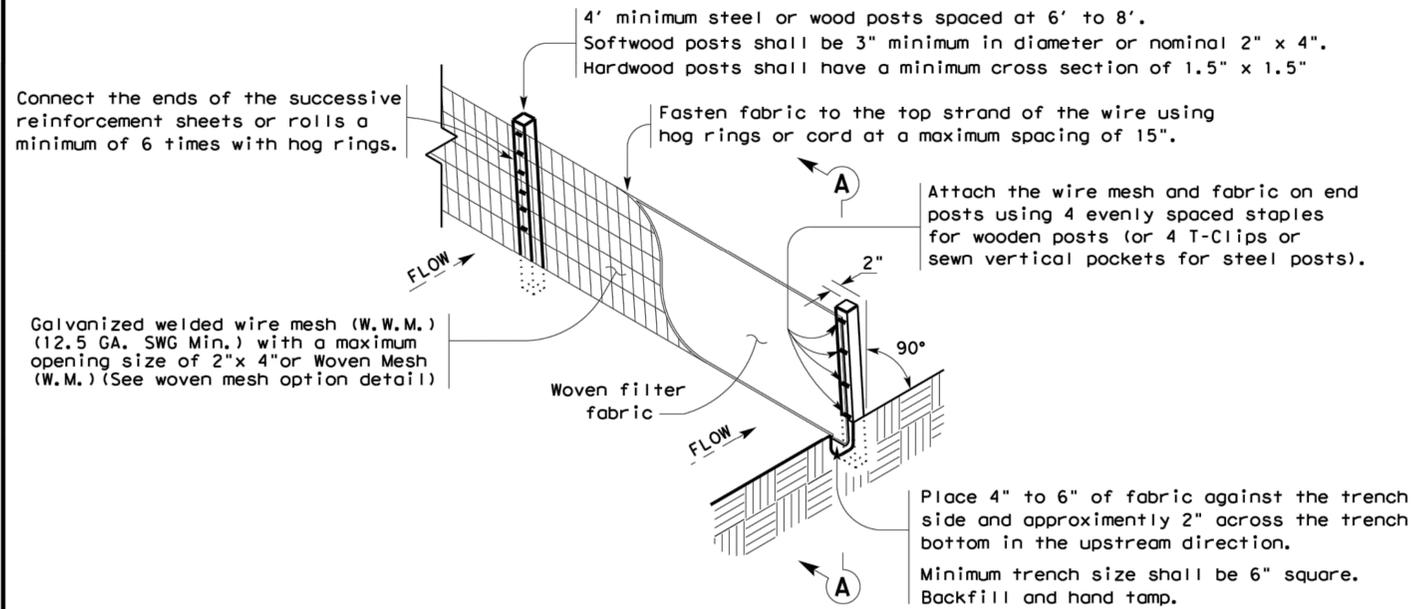
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REVISIONS				
	DIST	COUNTY		SHEET NO.

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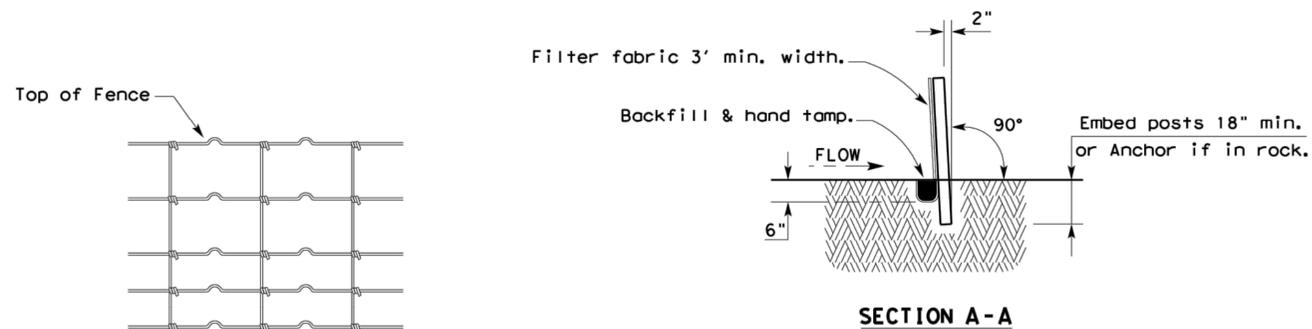
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TEMPORARY SEDIMENT CONTROL FENCE

SCF



HINGE JOINT KNOT WOVEN MESH (OPTION) DETAIL

Galvanized hinge joint knot woven mesh (12.5 GA. SWG Min.) requires a minimum of five horizontal wires spaced at a maximum of 12 inches apart and all vertical wires spaced at a maximum of 12 inches apart.

SEDIMENT CONTROL FENCE USAGE GUIDELINES

A sediment control fence may be constructed near the downstream perimeter of a disturbed area along a contour to intercept sediment from overland runoff. A 2 year storm frequency may be used to calculate the flow rate to be filtered.

Sediment control fence should be sized to filter a maximum flow through rate of 100 GPM/FT². Sediment control fence is not recommended to control erosion from a drainage area larger than 2 acres.

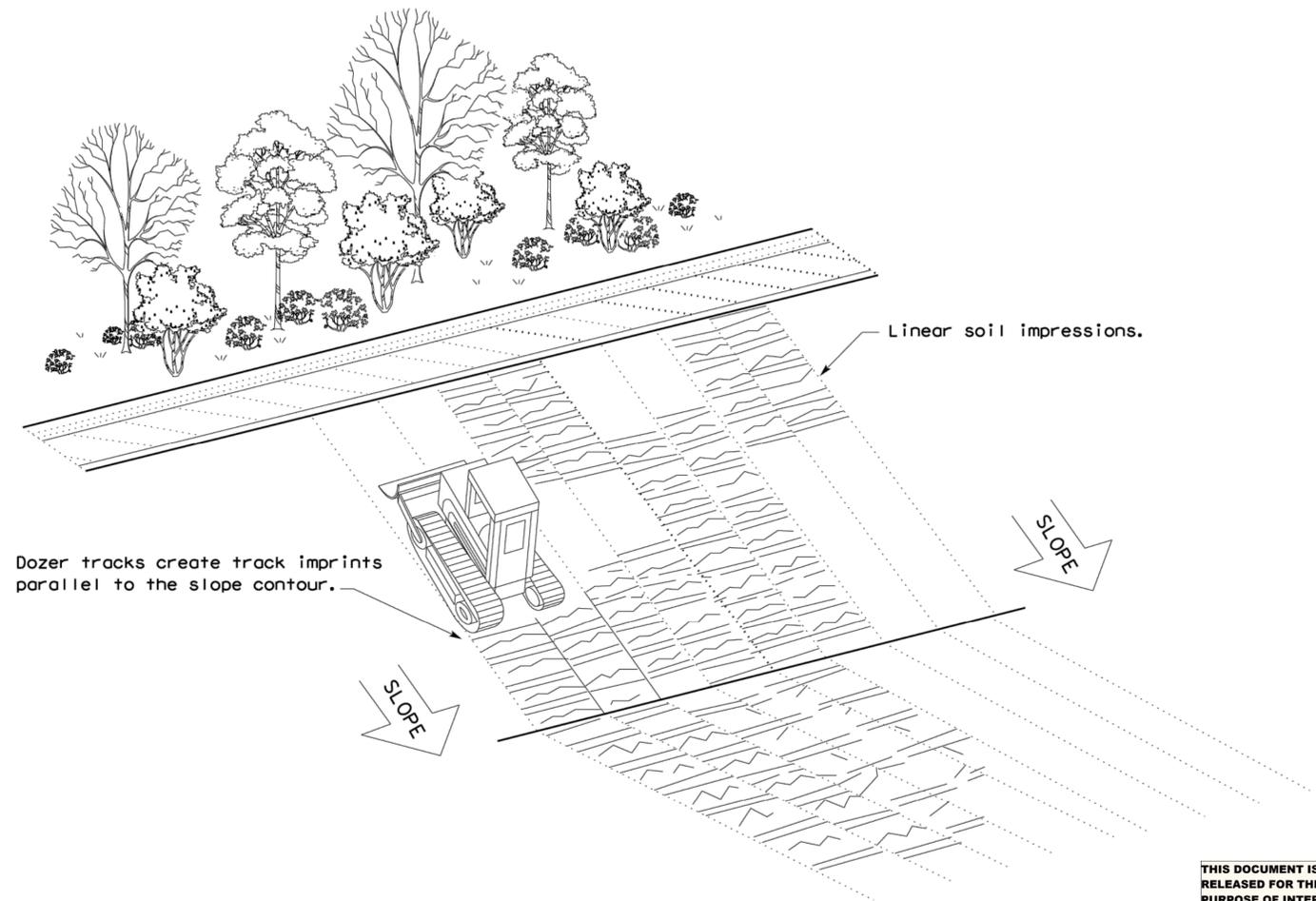
LEGEND

Sediment Control Fence

SCF

GENERAL NOTES

1. Vertical tracking is required on projects where soil distributing activities have occurred unless otherwise approved.
2. Perform vertical tracking on slopes to temporarily stabilize soil.
3. Provide equipment with a track undercarriage capable of producing linear soil impressions measuring a minimum of 12" in length by 2" to 4" in width by 1/2" to 2" in depth.
4. Do not exceed 12" between track impressions.
5. Install continuous linear track impressions where the minimum 12" length impressions are perpendicular to the slope or direction of water flow.



VERTICAL TRACKING

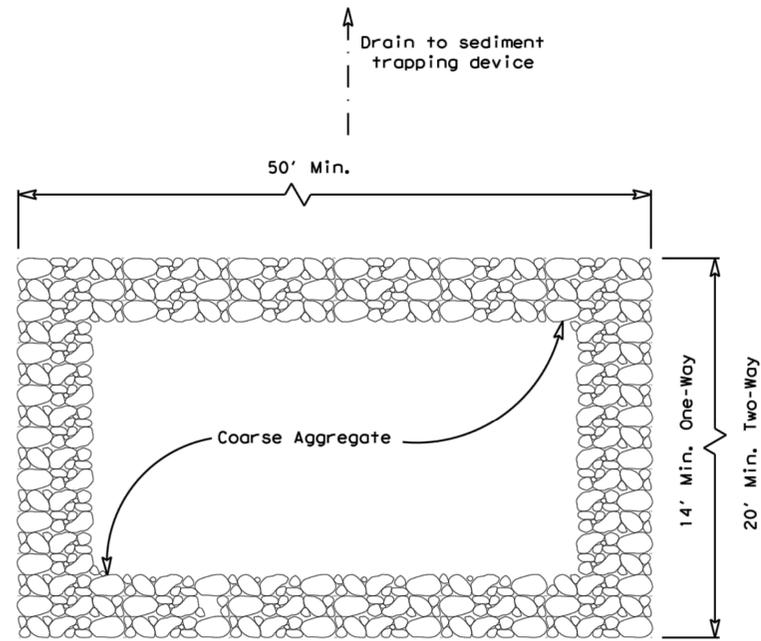
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		Design Division Standard	
TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES FENCE & VERTICAL TRACKING			
EC(1)-16			
FILE: ec116	DN: TxDOT	CK: KM	DW: VP
© TxDOT: JULY 2016	CONT	SECT	JOB
REVISIONS		HIGHWAY	
DIST		COUNTY	
		SHEET NO.	

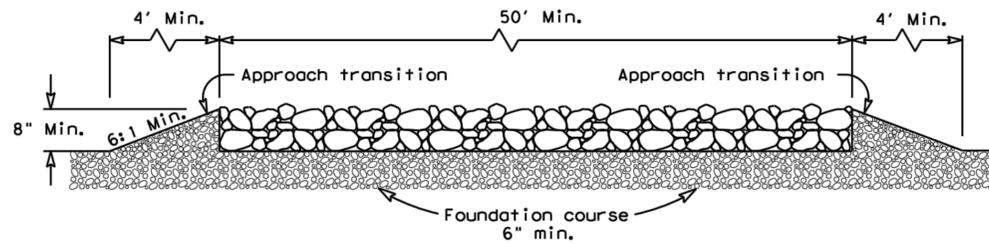
DATE FILE

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DATE: \$DATE\$
 FILE: \$FILE\$



PLAN VIEW

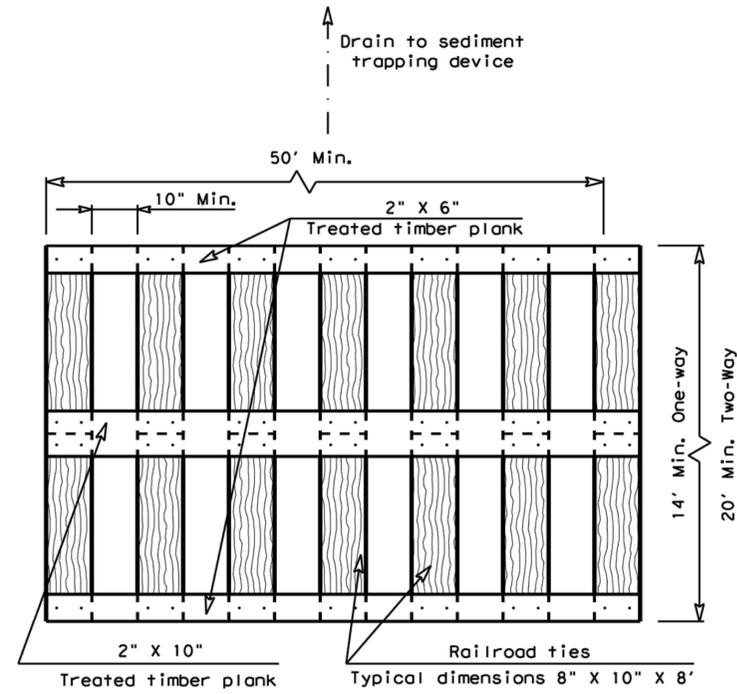


ELEVATION VIEW

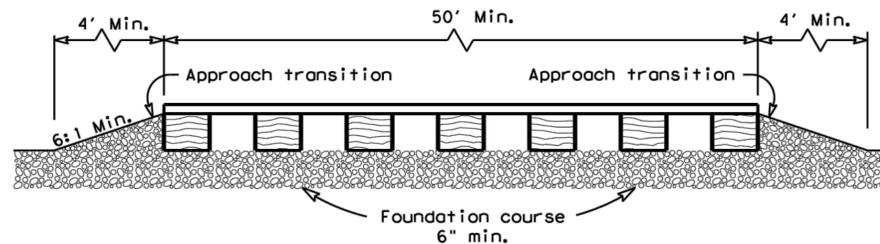
CONSTRUCTION EXIT (TYPE 1)
ROCK CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 1)

- The length of the type 1 construction exit shall be as indicated on the plans, but not less than 50'.
- The coarse aggregate should be open graded with a size of 4" to 8".
- The approach transitions should be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials approved by the Engineer.
- The construction exit shall be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



PLAN VIEW

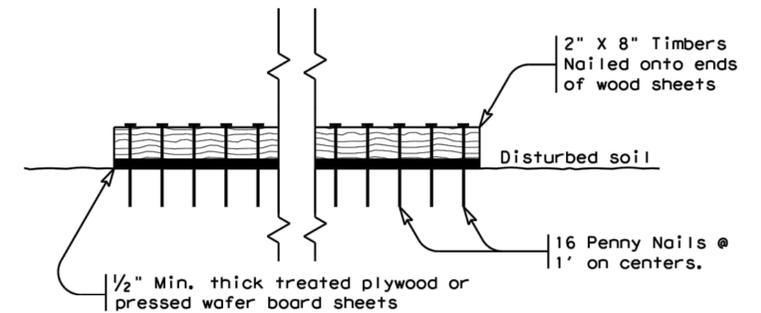
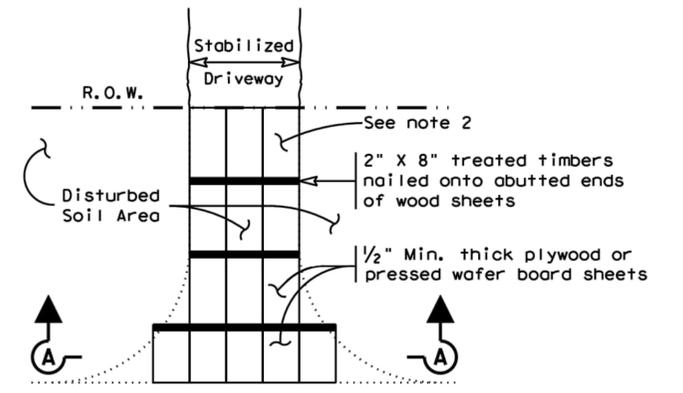


ELEVATION VIEW

CONSTRUCTION EXIT (TYPE 2)
TIMBER CONSTRUCTION (LONG TERM)

GENERAL NOTES (TYPE 2)

- The length of the type 2 construction exit shall be as indicated on the plans, but not less than 50'.
- The treated timber planks shall be attached to the railroad ties with 1/2" x 6" min. lag bolts. Other fasteners may be used as approved by the Engineer.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The approach transitions shall be no steeper than 6:1 and constructed as directed by the Engineer.
- The construction exit foundation course shall be flexible base, bituminous concrete, portland cement concrete or other material as approved by the Engineer.
- The construction exit should be graded to allow drainage to a sediment trapping device.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.
- Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed by the engineer.



CONSTRUCTION EXIT (TYPE 3)
SHORT TERM

GENERAL NOTES (TYPE 3)

- The length of the type 3 construction exit shall be as shown on the plans, or as directed by the Engineer.
- The type 3 construction exit may be constructed from open graded crushed stone with a size of two to four inches spread a min. of 4" thick to the limits shown on the plans.
- The treated timber planks shall be #2 grade min., and should be free from large and loose knots.
- The guidelines shown hereon are suggestions only and may be modified by the Engineer.

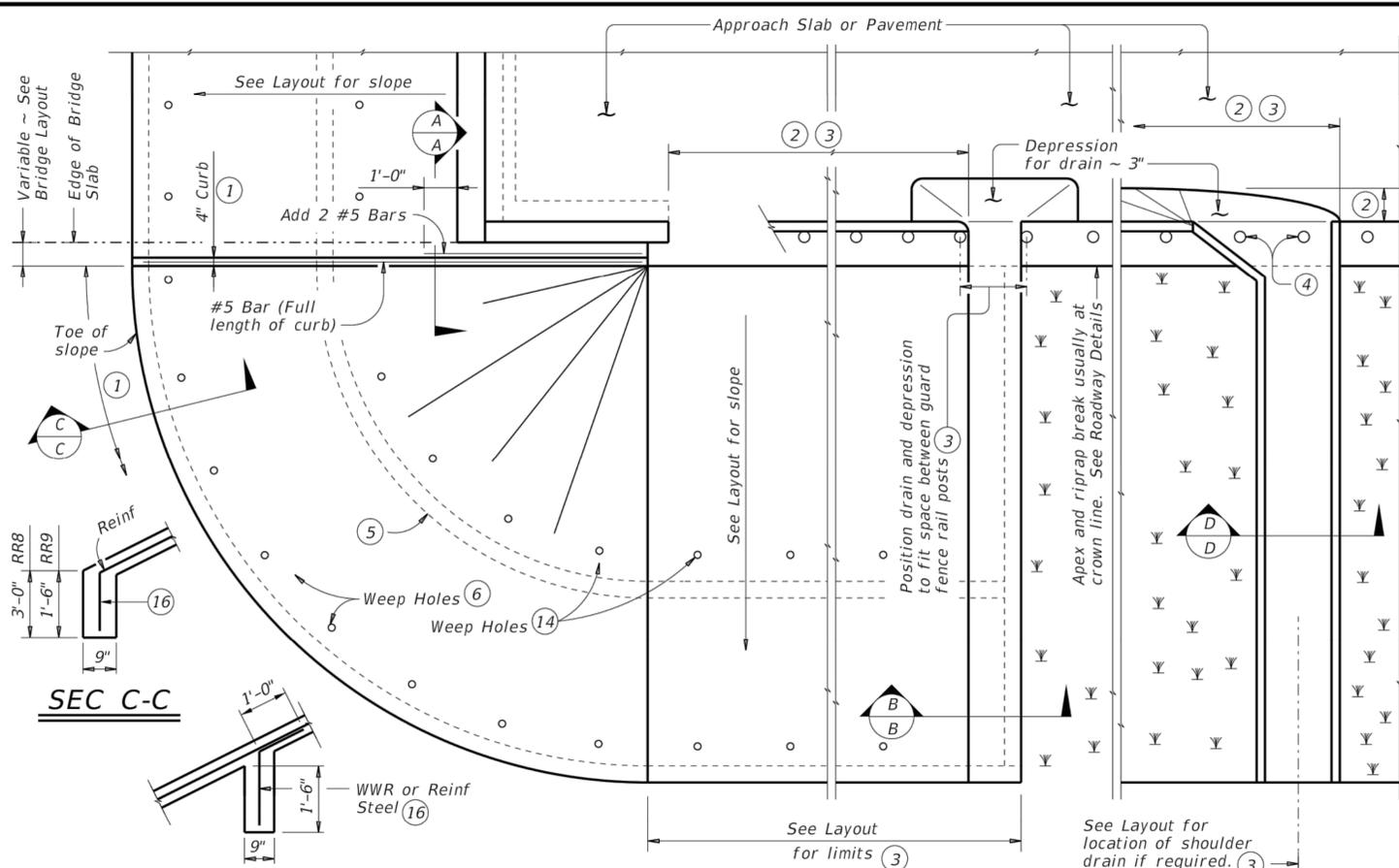
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TEMPORARY EROSION, SEDIMENT AND WATER POLLUTION CONTROL MEASURES CONSTRUCTION EXITS EC(3)-16

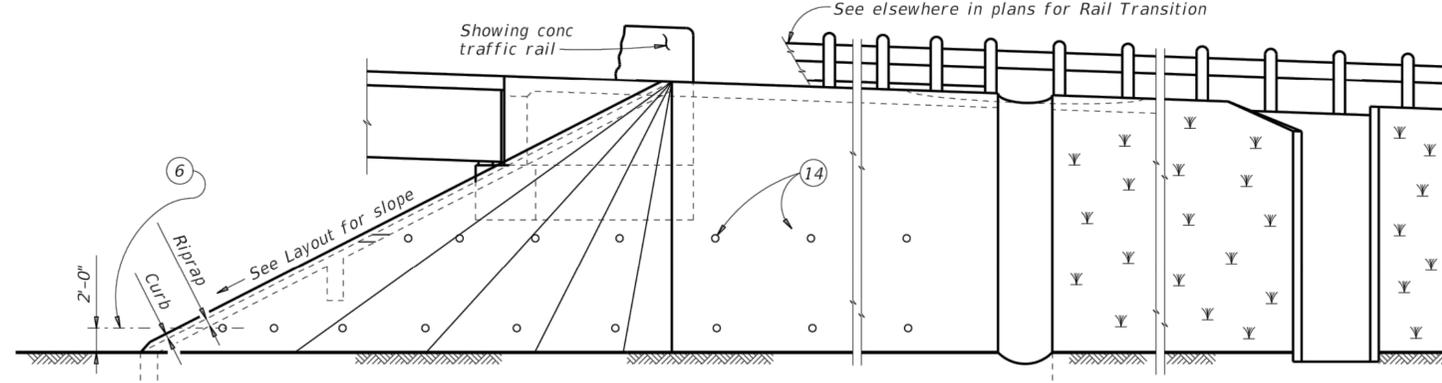
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© TxDOT: JULY 2016	CONT	SECT	JOB	HIGHWAY
REVISIONS	\$CS\$	\$SS\$	\$JS\$	\$HWY\$
DIST	COUNTY	SHEET NO.		
\$DST\$	\$CTY\$	\$EC	\$BA	\$16\$

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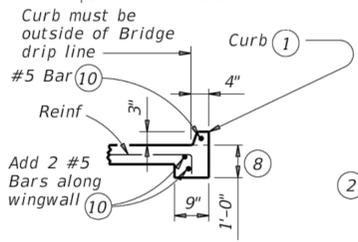


INTERMEDIATE TOEWALL

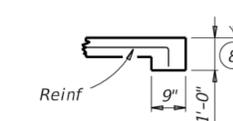
PLAN



ELEVATION

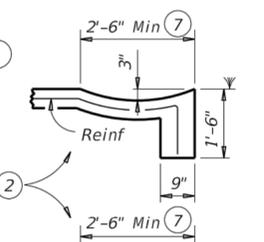


SEC A-A



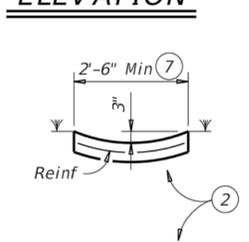
SEC B-B

(No Drain)



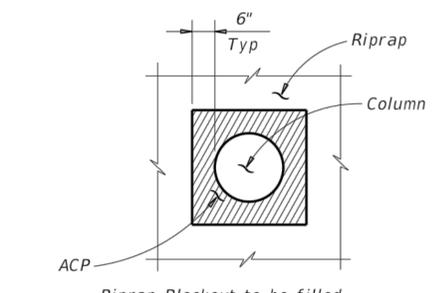
SEC B-B

(Shoulder Drain integral with riprap)



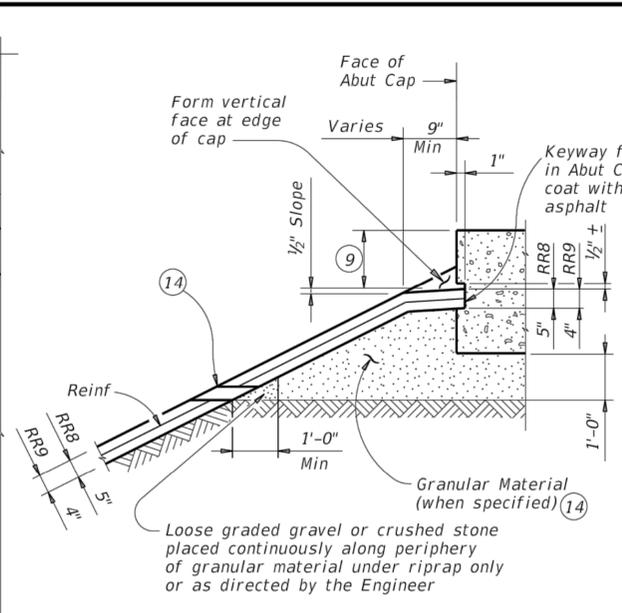
SEC D-D

(Shoulder Drain)

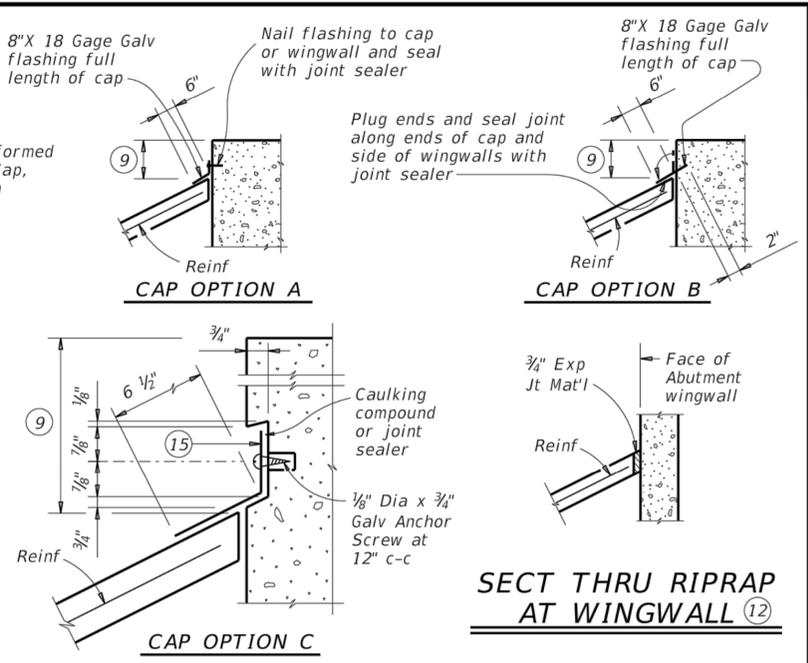


RIPRAP DETAIL AT COLUMNS

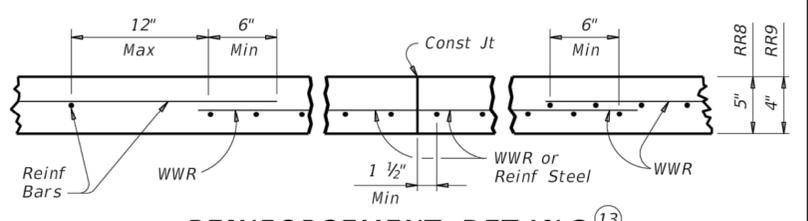
(As directed by the Engineer)



SHOWING KEYWAY OPTION



SECTIONS THRU RIPRAP AT CAP



REINFORCEMENT DETAILS

See General Notes for optional synthetic fiber reinforcement.

- 1 When riprap is shown extended around header on layout, extend slab and toewall as shown and eliminate 4" curb.
- 2 Limits and configuration of drains and depressions are as shown elsewhere in plans or as directed by the Engineer.
- 3 Location of shoulder drain must consider limitations imposed by rail transition. Do not locate shoulder drains at expansion joints between approach slab and concrete pavement.
- 4 See details elsewhere in plans for installation of guard fence posts through concrete riprap.
- 5 Provide intermediate toewall only when designated elsewhere in the plans or included in the specifications.
- 6 Provide lower level of 2" Dia weep holes at 10' c-c backed by 1 CF packet of gravel and galvanized hardware cloth at all locations unless directed by the Engineer to eliminate.
- 7 Use wider or other drain configurations if shown elsewhere in plans or if directed by the Engineer.
- 8 Wall extension may be reduced or modified if approved by the Engineer. Increase wall extension to 1'-6" whenever the optional intermediate toewall is called for in the plans.
- 9 Top of cap to top of riprap dimension varies as directed by the Engineer. Should be 9" Min for beam/slab type bridges and 1'-6" for slab span, box beam, or slab beam bridges.
- 10 #5 bars shown are required even when synthetic fiber reinforcing option is selected.
- 11 Provide sealing option for joint between the face of cap and riprap as designated by the Engineer or as shown elsewhere on plans.
- 12 Flashing (shown in Cap Option A) may be used at wingwall in addition to Exp Jt Mat'l if shown on plans or directed by the Engineer.
- 13 Provide #3 reinforcing bars at 18" Spa c-c. Provide Welded Wire Reinforcement (WWR) as 6x6-D3xD3. Combinations of WWR and reinforcing bars may be used if both are permitted. Use lap splices of a minimum 6 inches, measured from the transverse wire of WWR, and the ends of reinforcing bars.
- 14 If granular material is specified, provide upper level of 2" Dia weep holes at 10' c-c backed by galvanized hardware cloth.
- 15 8" x 18 Gage Galv Sheet Metal
- 16 Provide WWR or #3 bars, with 1'-0" extension into slope.

GENERAL NOTES:

Provide Class "B" concrete with a minimum compressive strength of 2,000 psi unless noted elsewhere in plans.
 Provide Grade 60 reinforcing steel.
 Provide synthetic fibers listed on the "Fibers for Concrete" Material Producer List (MPL) in lieu of steel reinforcing in riprap concrete unless noted otherwise.
 Install construction joints or grooved joints extending the full slope height at intervals of approximately 20 feet unless otherwise directed by the Engineer.
 Hardware cloth, loose grade stone behind weep holes, flashing, or other sealing material are subsidiary to the bid item "Riprap".
 Use reinforcing bars, deformed Welded Wire Reinforcing (WWR), or any suitable combination of both types for riprap reinforcing specified elsewhere in the plans.
 See Layout for limits of riprap.
 RR8 is to be used on stream crossings.
 RR9 is to be used on other embankments.

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		Bridge Division Standard	
CONCRETE RIPRAP AND SHOULDER DRAINS EMBANKMENTS AT BRIDGE ENDS (TYPES RR8 & RR9)			
CRR			
FILE: crrstde1.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
©TxDOT January 2015	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

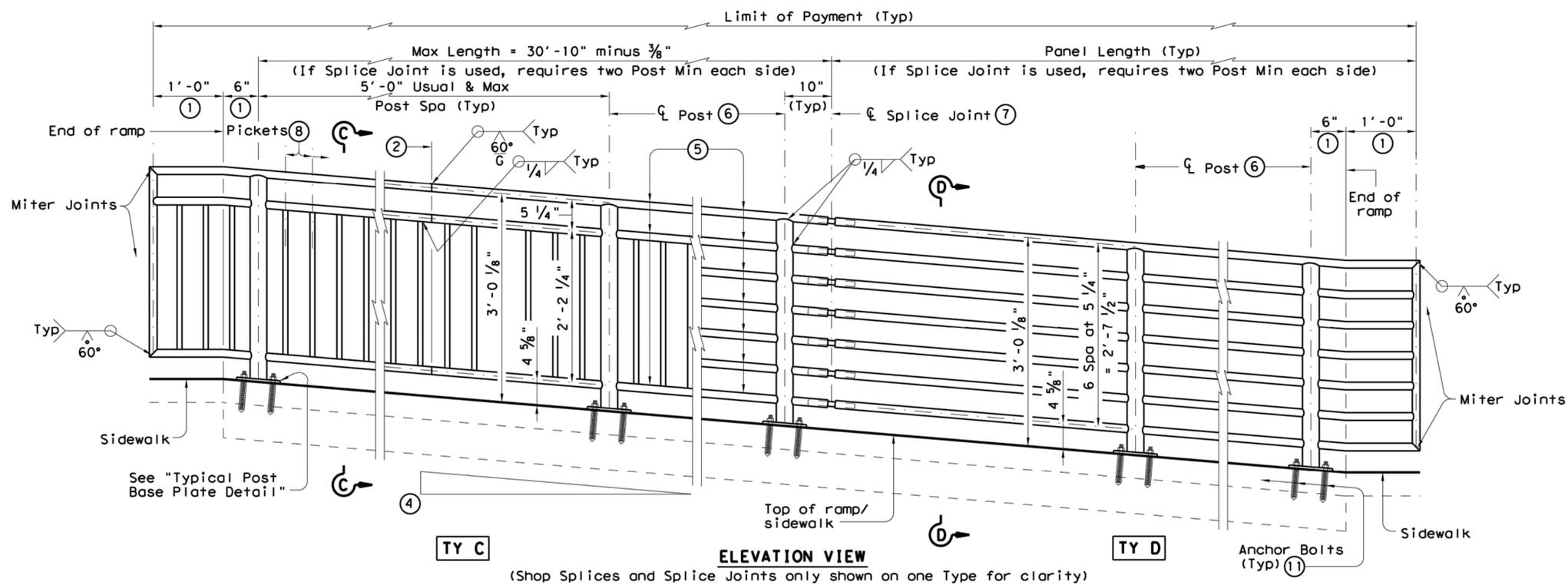
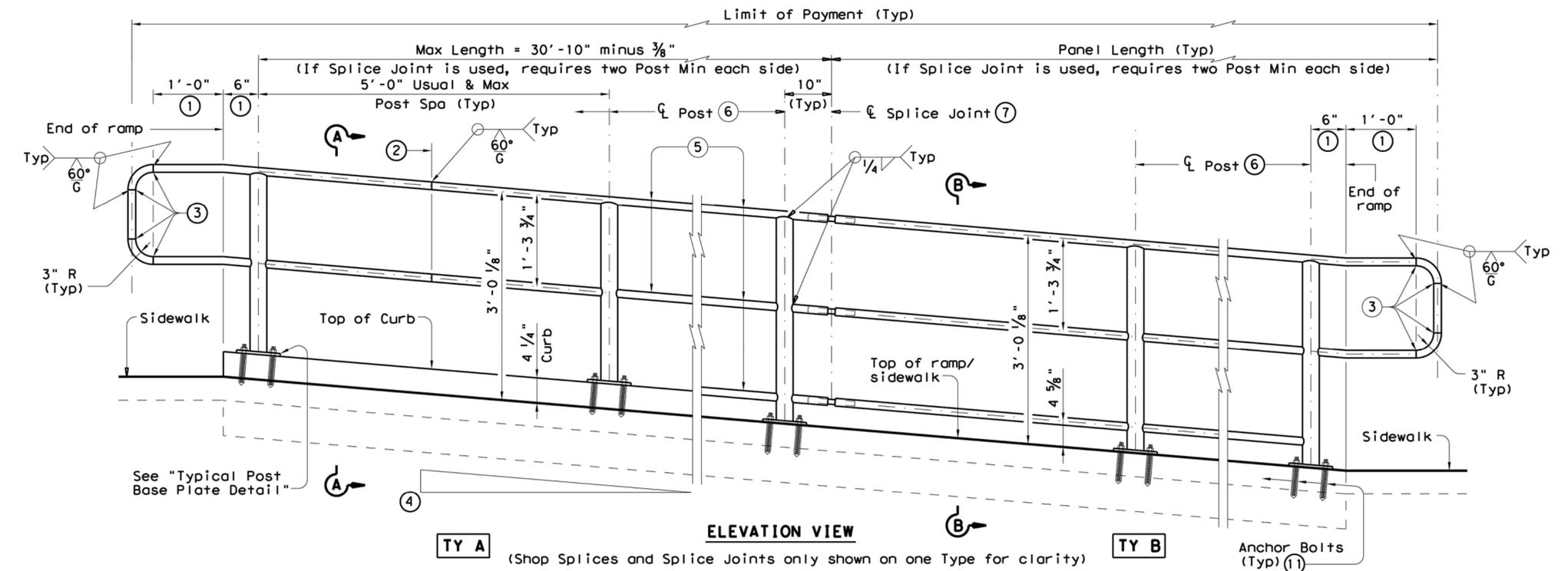
FOR CONTRACTOR'S INFORMATION ONLY:
 5" of RR8 = 0.015 CY/SF
 4" of RR9 = 0.012 CY/SF
 #3 Reinf at 18" c-c = 0.501 Lbs/SF
 6x6-D3xD3 = 0.408 Lbs/SF

DATE: FILE:

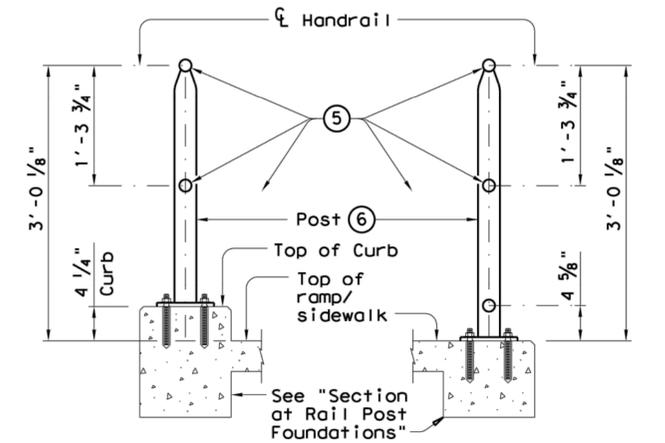
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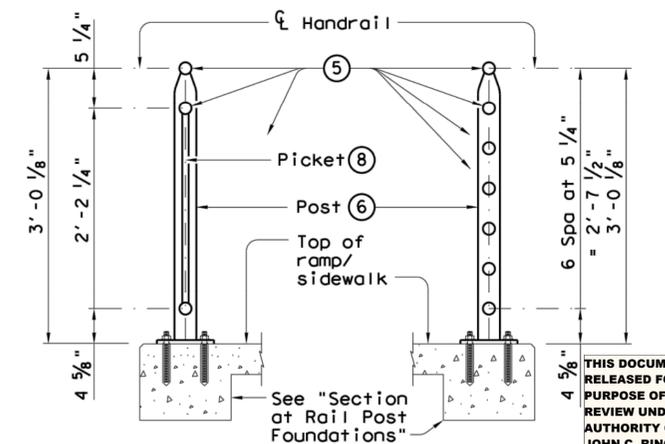
DATE:
FILE:



RECOMMENDED USAGE ⑨ ⑩	
Dropoff Height/Condition	Recommended Rail Options
< 30" dropoff	TY A, TY B, TY C, or TY D
≥ 30" dropoff, or along Bike Path	TY E or TY F



SECTION A-A (Showing Handrail TY A)
SECTION B-B (Showing Handrail TY B)



SECTION C-C (Showing Handrail TY C)
SECTION D-D (Showing Handrail TY D)

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- ① Parallel to ground.
- ② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
- ⑤ 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.

- ⑥ 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
- ⑦ See "Handrail Fabrication Details" for Splice Joints.
- ⑧ 5/8" Dia. Round Bar equal spacing at 4 1/2" Max. Plumb all pickets.
- ⑨ When needed for accessibility (grade > 5 percent) or as needed for pedestrian safety.
- ⑩ Not to be used on bridges.
- ⑪ See "General Notes" for anchor bolt information.

SHEET 1 OF 3



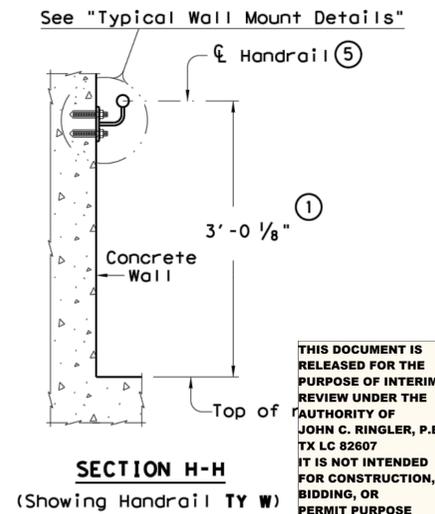
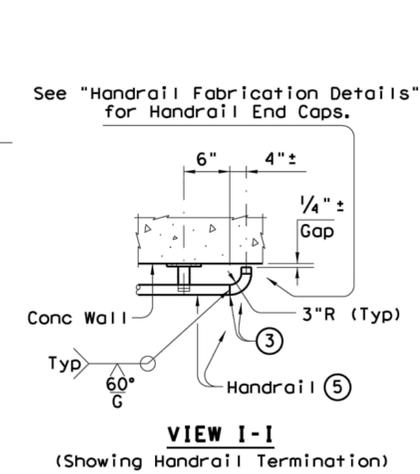
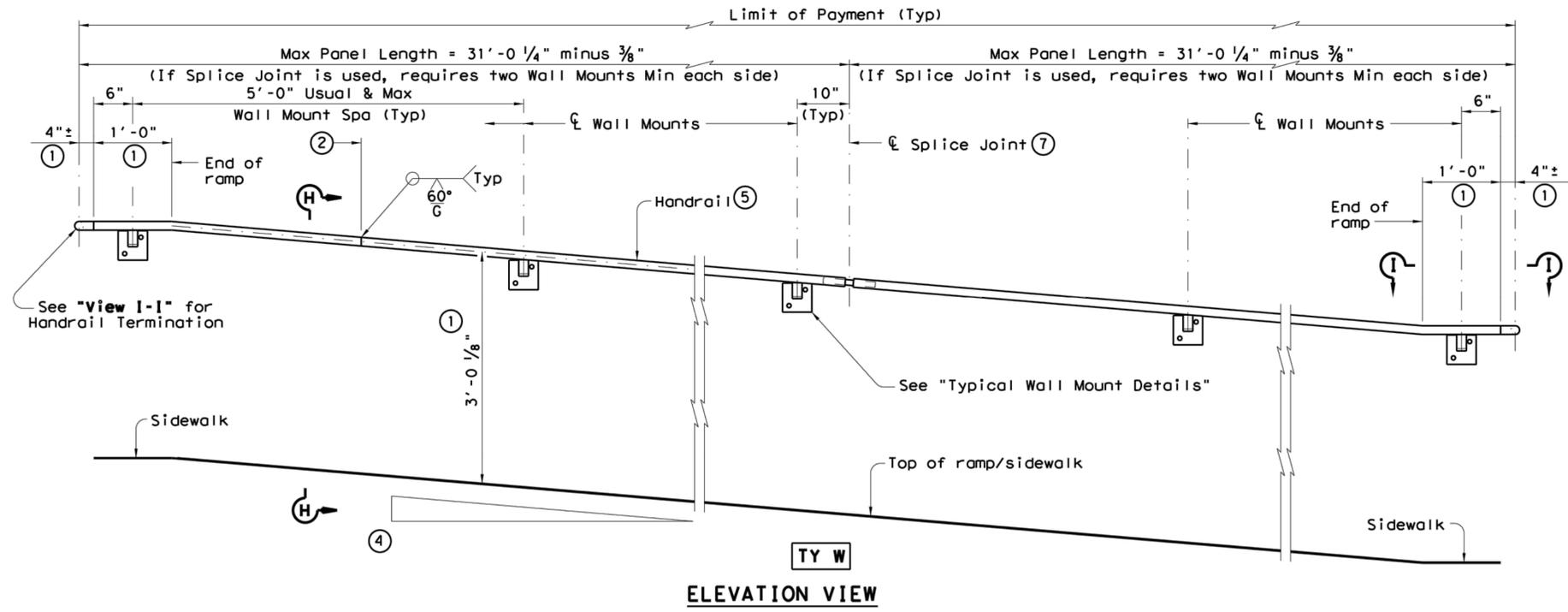
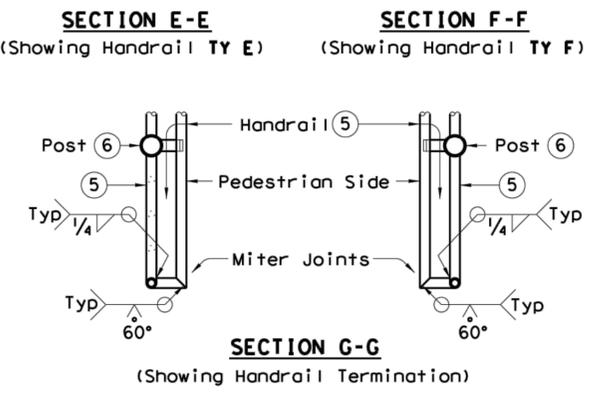
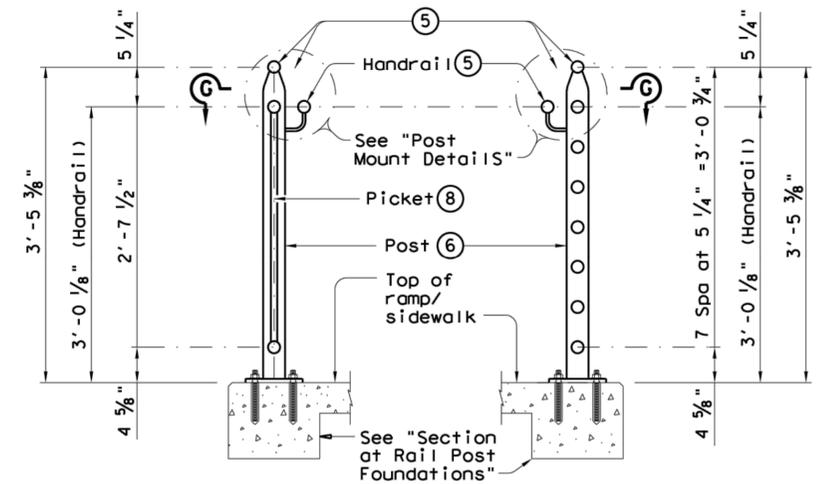
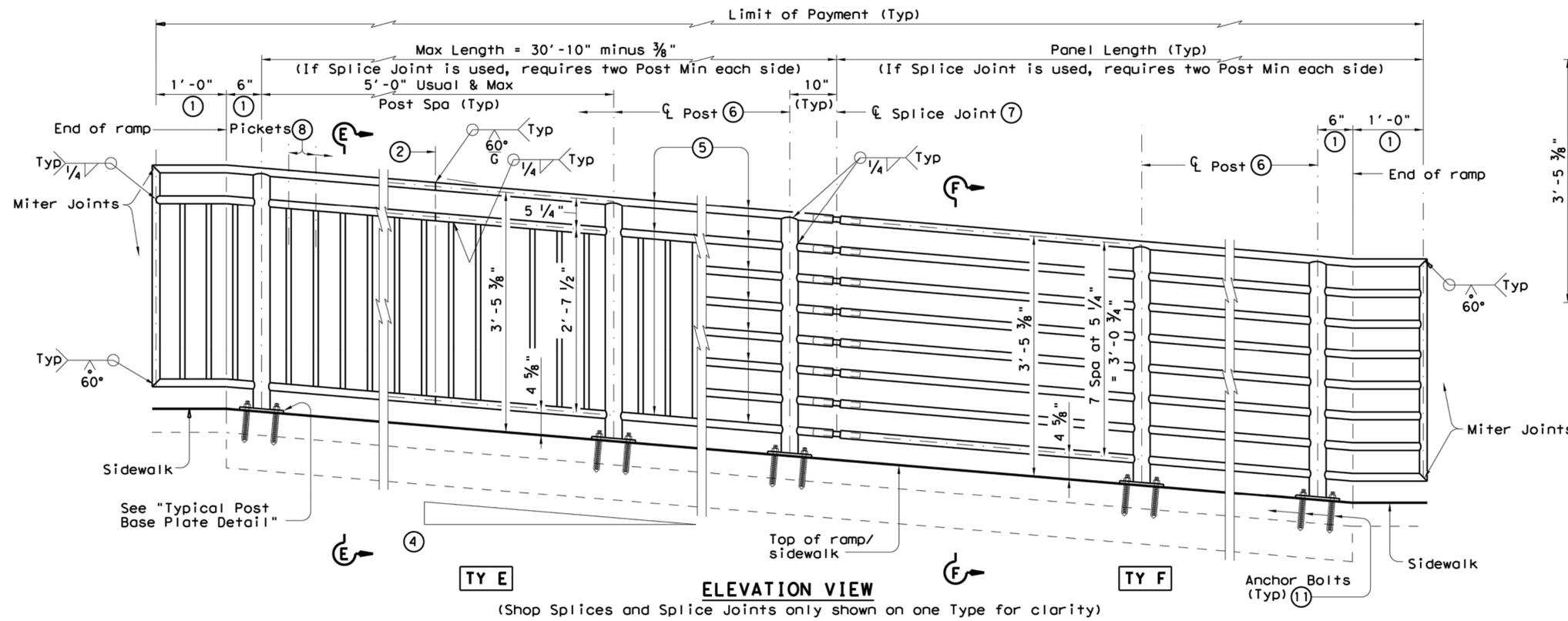
PEDESTRIAN HANDRAIL DETAILS

PRD-13

FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR	CK: CGL
© TxDOT December 2006	CONT	SECT	JOB	HIGHWAY
REVISIONS				
REVISED MAY, 2013 (VP)	DIST	COUNTY		SHEET NO.

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- ① Parallel to ground.
- ② One shop splice per panel is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ③ Shop splice is permitted with minimum 85 percent penetration. The weld may be square groove or single vee groove. Grind smooth.
- ④ See Ramp Details located elsewhere in plans for ramp slope and dimensions. Maximum ramp slope will not exceed 8.3 percent. Level landing required for each 30" rise if grade exceeds 5 percent.
- ⑤ 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp / sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
- ⑥ 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). See "Post Mount Detail" for crimping and trimming post to fit Dia. of top rail. Provide holes as needed in post for galvanizing drainage and venting. Plumb all posts.
- ⑦ See "Handrail Fabrication Details" for Splice Joints.
- ⑧ 1/2" Dia. Round Bar equal spacing at 4 1/2" Max. Plumb all pickets.
- ⑪ See "General Notes" for anchor bolt information.

SHEET 2 OF 3

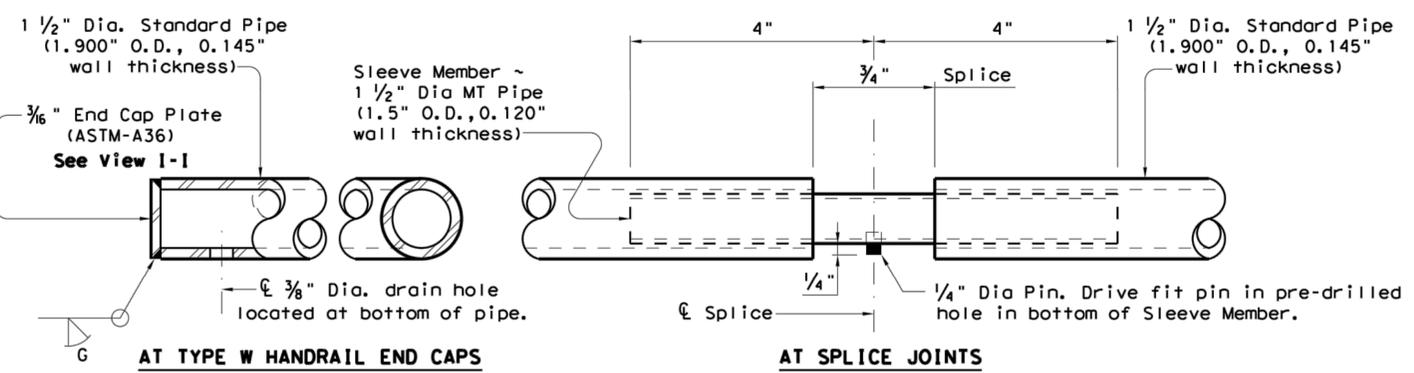
Texas Department of Transportation
Design Division Standard

PEDESTRIAN HANDRAIL DETAILS

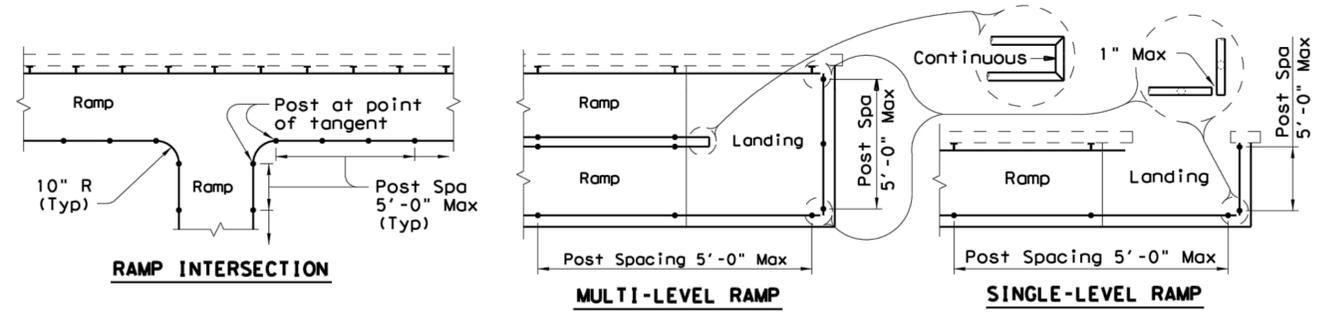
PRD-13

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REVISIONS				
REVISED MAY, 2013 (VP)	DIST	COUNTY	SHEET NO.	

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HANDRAIL FABRICATION DETAILS



PLAN SHOWING RAIL AT RAMP CONDITIONS

GENERAL NOTES

Designed according to ADAAG, Texas Accessibility Standards, Uniform Building Code, and AASHTO LRFD Specifications.

Handrail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for these modifications.

Pipe will conform to ASTM-A53 Grade B or A500 Grade B. Steel plates and steel bars will conform to ASTM-A36. Mechanical tubing (MT) will conform to ASTM A513 Grade 1015 or higher. Galvanize all steel components except reinforcing steel unless noted otherwise.

Concrete for foundations will be in accordance with Item 531 "Sidewalks". All reinforcing steel must be Grade 60. Bar laps, where required, will be as follows: Uncoated #4 = 1'-5" Epoxy coated #4 = 2'-1"

When the plans require painted steel, follow the requirements for painting galvanized steel in Item 446, "Cleaning and Painting Steel". Sleeve Members will receive galvanization and only get field painted after installation unless directed otherwise by Engineer.

Epoxy Anchor bolts for wall mount and post base plate will be 5/8 inch diameter ASTM A36 threaded rods with one hex nut and one hardened steel washer at each bolt. 3/8 inch diameter threaded rod embedment depth for wall mounts is 3 1/2 inches and embedment depth for post base plate is 5 inches.

Embed threaded rods into concrete with a Type III (Class C) epoxy meeting the requirements of DMS-6100, "Epoxyes and Adhesives". Mix and dispense adhesive with the manufacturer's static mixing nozzle/dual cartridge system. Core drill holes (percussion drilling not permitted).

At the contractor's option the post base plate anchor bolts may be cast with the Ramp/Sidewalk (See Cast-in-Place Anchor Bolt Options).

Optional cast-in-place anchor bolts will be 5/8 inch diameter ASTM A307 Grade A bolts (or A36 threaded rods with one tack welded hex nut each) with one hex nut and one hardened steel washer at each bolt. Embedment depth of cast-in-place bolt will be 8 inches for post base plate.

Handrails and any wall or other surface adjacent to them will be free of any sharp or abrasive elements.

Submit shop drawings to the Engineer unless otherwise noted. For curved handrail applications, fabricate the handrail to the curve if radius is less than 600 feet. Shop drawings are required when rail is fabricated to the curve.

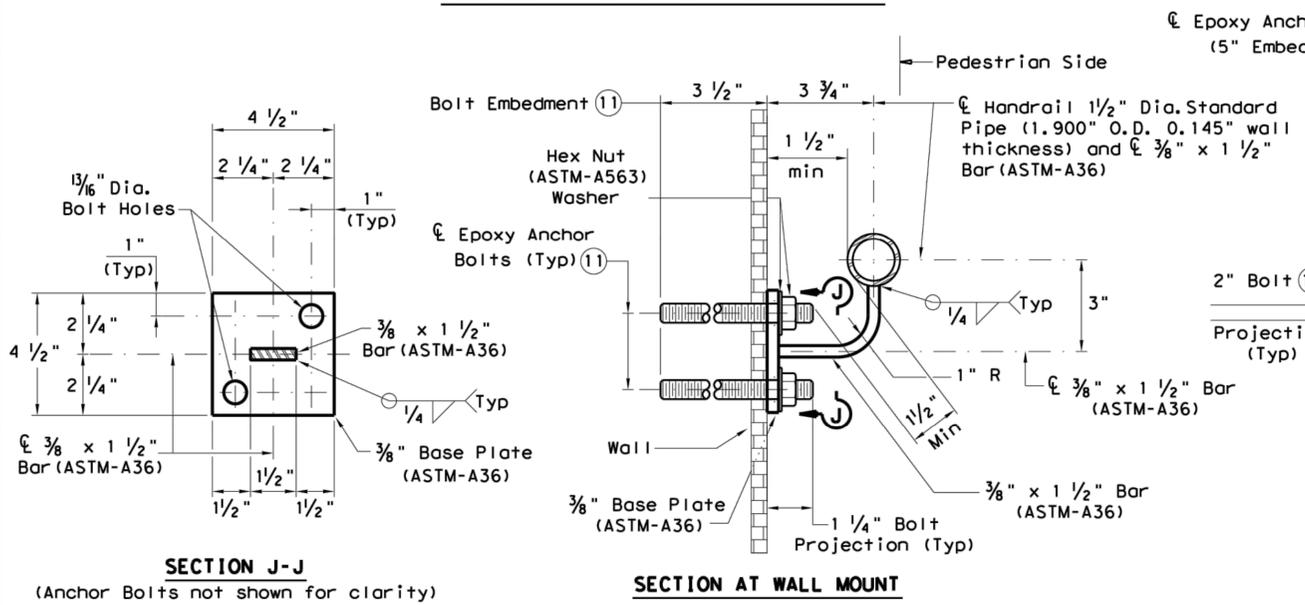
For all handrails, erection drawings will be submitted to the Engineer for approval to ensure proper installation.

Drawings will show handrail mount locations with bolts setting, slope, and/or splice joint locations, and handrail lengths with indicating showing where each handrail goes on the layout.

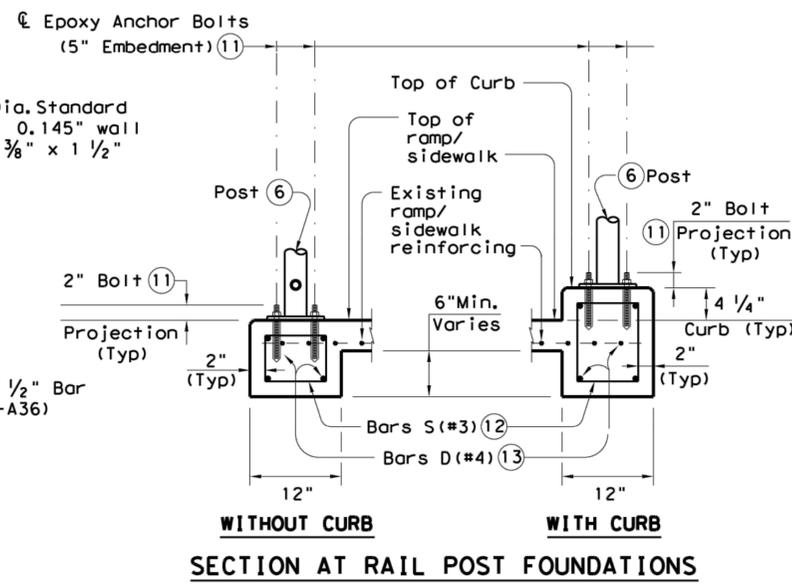
Payment for concrete sidewalks or curb ramps will be paid for in accordance with Item 531 "Sidewalks".

Payment for all items shown is to be included in unit price bid in accordance with Item 450 "Railing" of the type specified.

All exposed edges will be rounded or chamfered to approximately 1/8 inch.

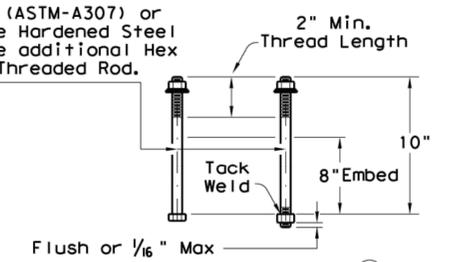


TYPICAL WALL MOUNT DETAILS

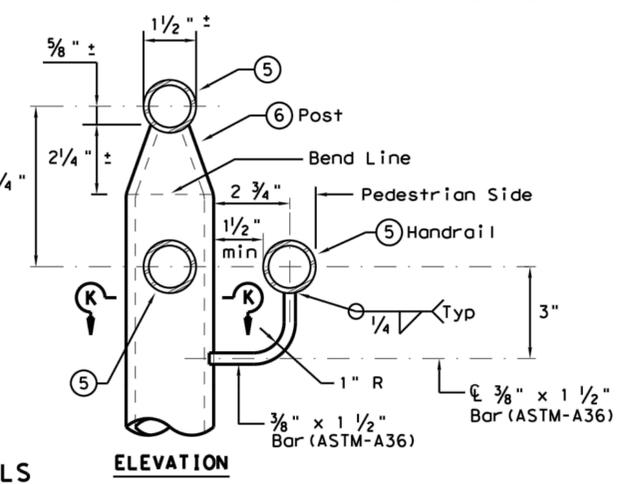
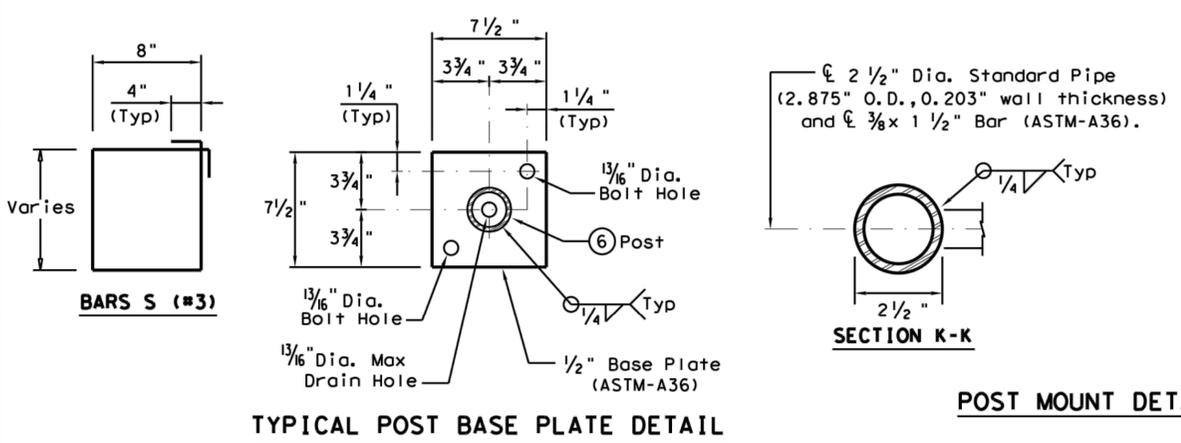


SECTION AT RAIL POST FOUNDATIONS

5/8 inch diameter Hex Head Anchor Bolt (ASTM-A307) or Threaded Rod (ASTM-A36) with one Hardened Steel Washer placed under Hex Nut. One additional Hex Nut will be furnished for each Threaded Rod.



- 5 1 1/2" Dia. Standard Pipe (1.900" O.D., 0.145" wall thickness). Parallel to ramp/sidewalk. Provide holes as needed in 1 1/2" Dia. pipe for galvanizing drainage and venting.
- 6 2 1/2" Dia. Standard Pipe (2.875" O.D., 0.203" wall thickness). Plumb all posts. See "Post Mount Detail" for crimping and trimming post to fit the diameter of top rail. Provide holes as needed in post for galvanizing drainage and venting.
- 11 See "General Notes" for anchor bolt information.
- 12 Bars S(#3) spaced at 12" Max (Spaced 3" from outside edge of overall length of Ramp/Sidewalk).
- 13 Provide 1 1/2" end cover to Bars D(#4) from outside edge of overall length of Ramp/Sidewalk.



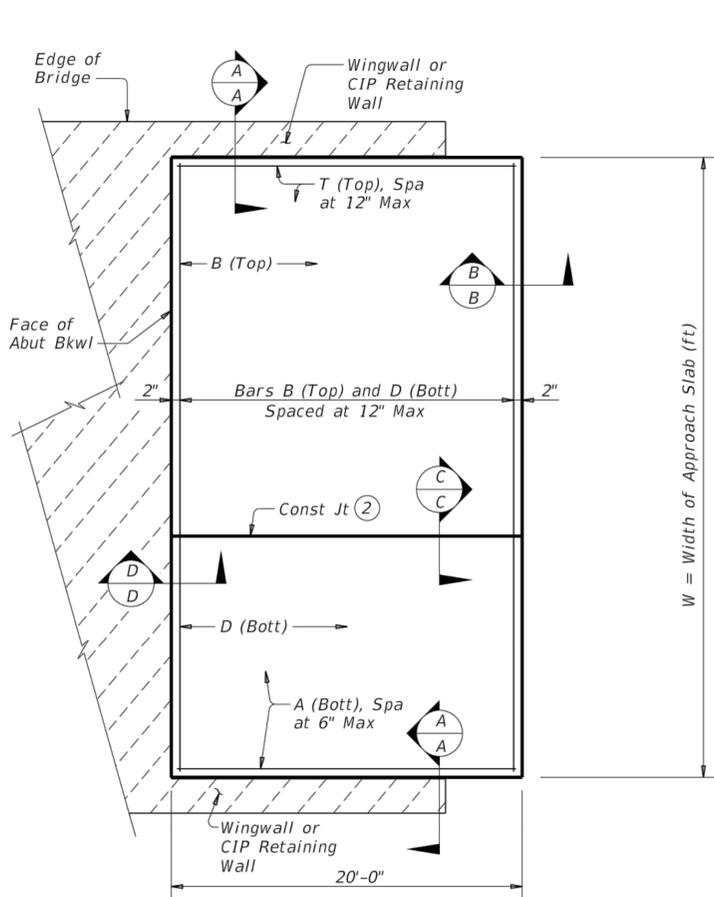
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FILE: _____

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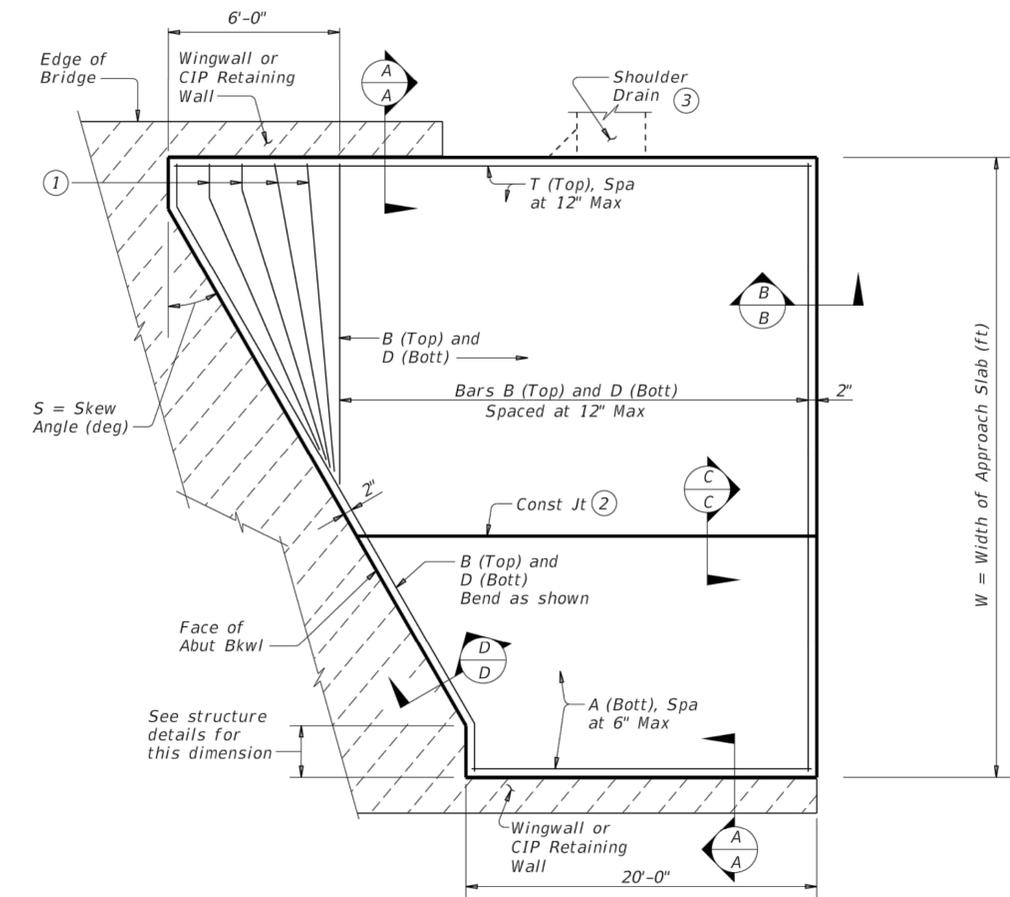
		Design Division Standard	
<h2>PEDESTRIAN HANDRAIL DETAILS</h2> <h3>PRD-13</h3>			
FILE: prd13.dgn	DN: TxDOT	CK: AM	DW: JTR
© TxDOT December 2006	CONT	SECT	JOB
REVISED MAY, 2013 (VP)	DIST		COUNTY
			SHEET NO.

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DATE: FILE:



PLAN
(Showing Non-Skewed Approach Slab)



PLAN
(Showing Skewed Approach Slab)

BAR TABLE	
BAR	SIZE
A	#8
B	#5
D	#5
T	#5

APPROXIMATE QUANTITIES ④

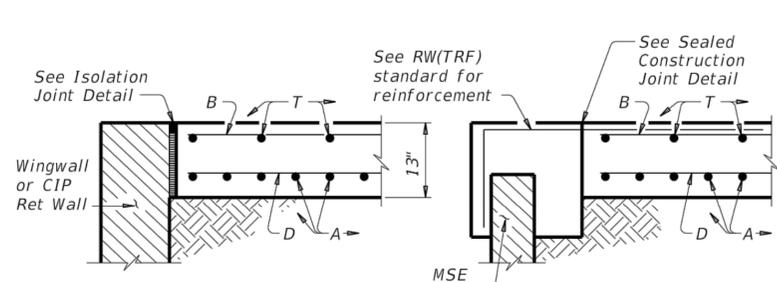
Reinf steel weight = 8.5 Lbs/SF of Approach Slab

Volume of Appr Slab Conc (CY) = $0.802W + 0.02W^2 \tan S$

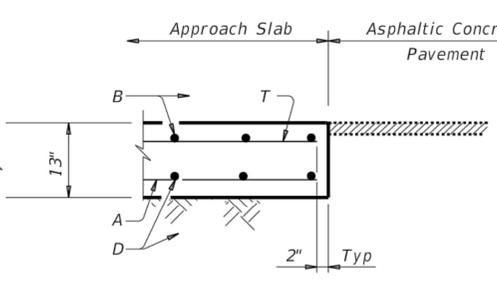
W = Width of Approach Slab (ft)

S = Skew Angle (deg)

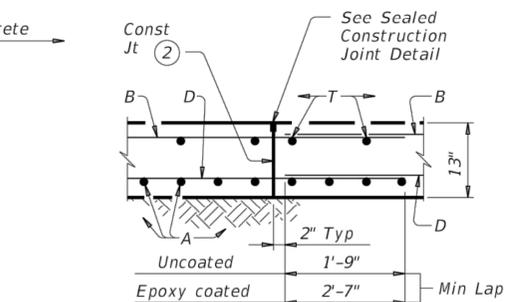
- ① Flare Bars B and D in this region (1'-6" Max Spa, 3" Min Spa). Minimum flared bar length = 2'-6". Bend bars as necessary.
- ② Provide longitudinal construction joints that align with longitudinal construction joints in the bridge slab with bridges built in stages. Other longitudinal construction joints must receive approval of the Engineer.
- ③ See details elsewhere in plans for shoulder drain location and details.
- ④ For Contractor's information only.
- ⑤ Multiple piece tie bars are acceptable at longitudinal construction joints provided minimum laps shown are achieved.
- ⑥ See details elsewhere in plans for required cross-slope.
- ⑦ Place in accordance with Item 438.
- ⑧ Backer rod shall be 25% larger than joint opening and shall be compatible with the sealant.
- ⑨ Place 1/2" Preformed Bituminous Fiber Material between concrete railing and top of approach slab as shown when concrete railing projects over the approach slab.



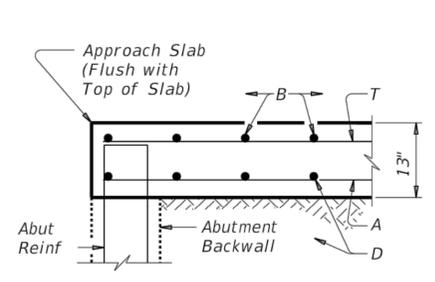
SECTION A-A



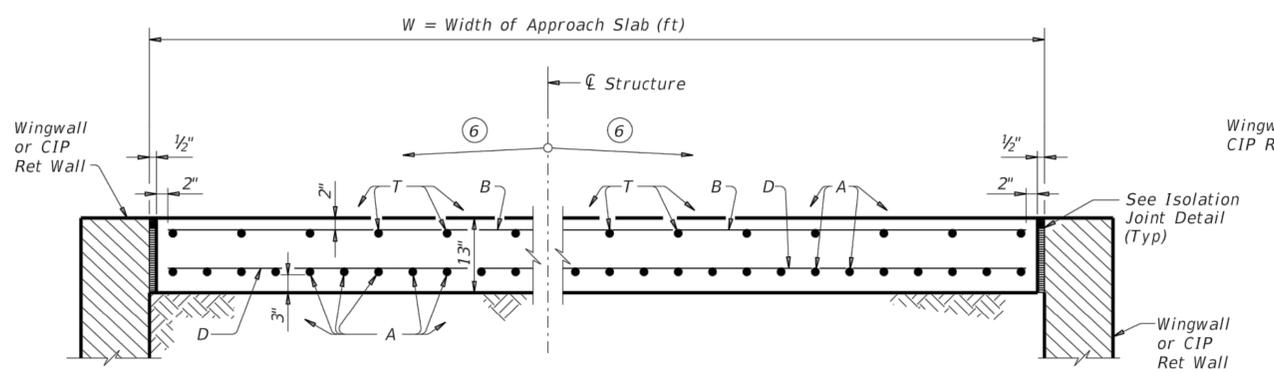
SECTION B-B



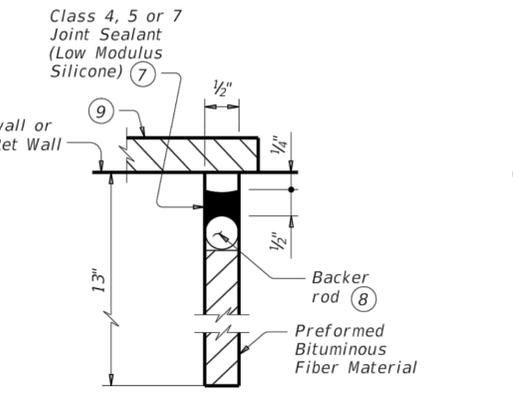
SECTION C-C ⑤



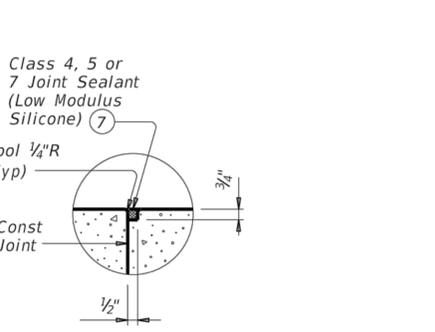
SECTION D-D



TYPICAL TRANSVERSE SECTION



ISOLATION JOINT DETAIL



SEALED CONSTRUCTION JOINT DETAIL

GENERAL NOTES:

Construct approach slab in accordance with Item 422. Provide Class "S" concrete with a minimum compressive strength of 4,000 psi. Provide Grade 60 reinforcing steel. Construct the subgrade or subbase from the bridge for a minimum distance of 100 feet prior to the approach slab, unless otherwise indicated on the plans. Compact and finish the subgrade or foundation for the approach slab to the typical cross-section and to the lines and grades shown on the plans. Cure for 4 days using water or membrane curing per Item 422. Sealant, backer rod and preformed bituminous fiber material are subsidiary to approach slab concrete. Provide a 1" bondbreaker (asphaltic concrete pavement or asphalt stabilized base) between the approach slab and cement stabilized backfill or cement treated base. Bondbreakers may be used if approved by the Engineer.

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Cover dimensions are clear dimensions, unless noted otherwise.

Texas Department of Transportation Bridge Division Standard

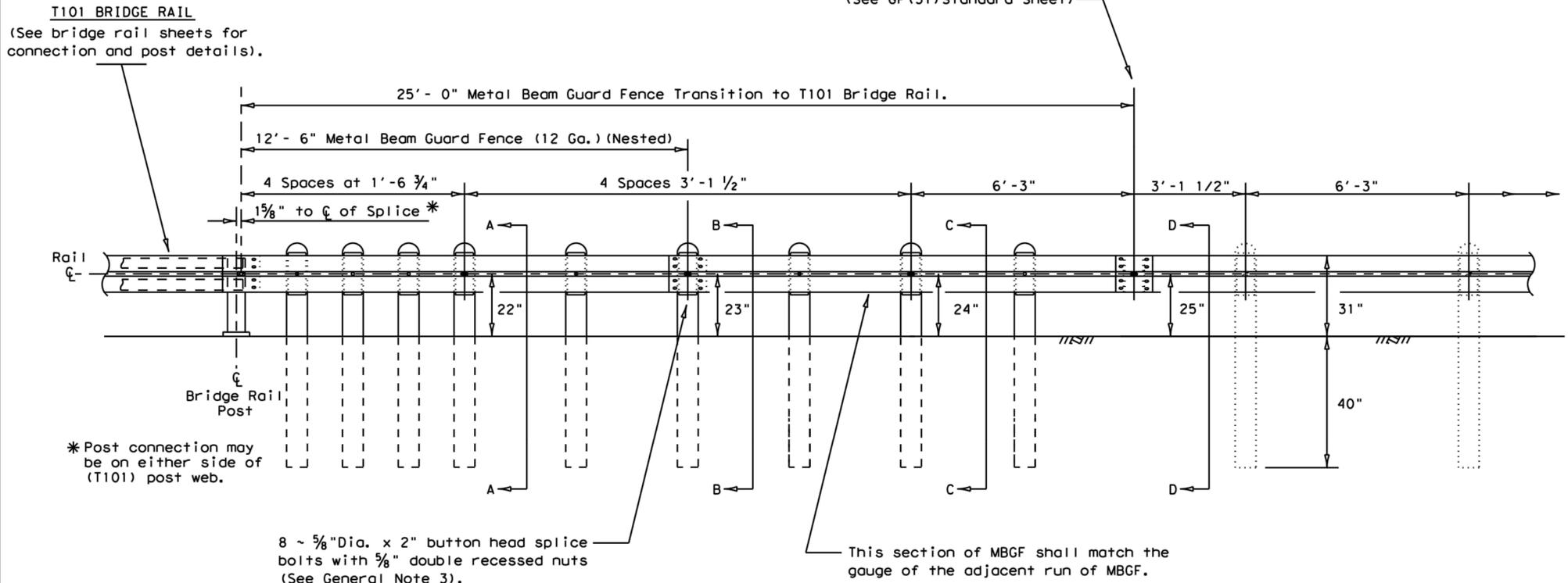
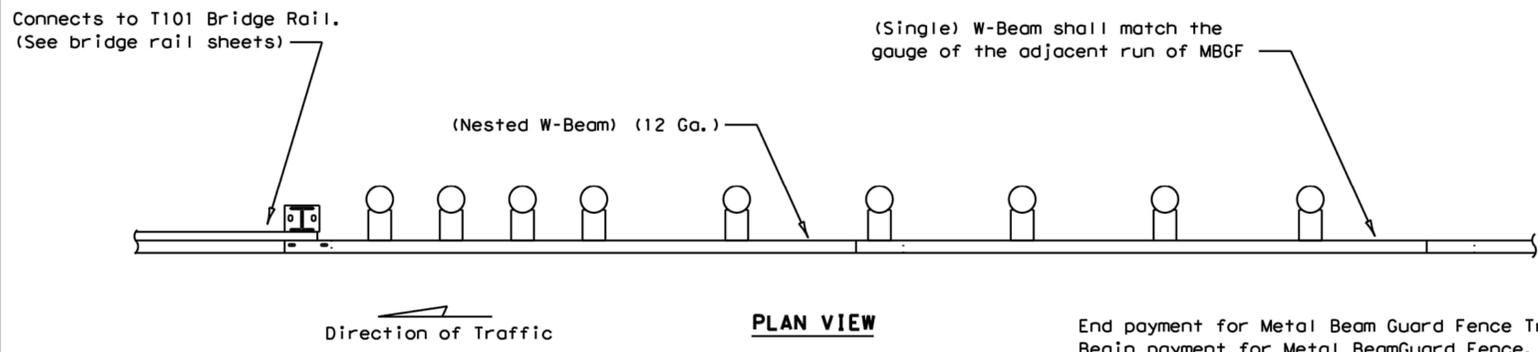
BRIDGE APPROACH SLAB ASPHALTIC CONCRETE PAVEMENT

BAS-A

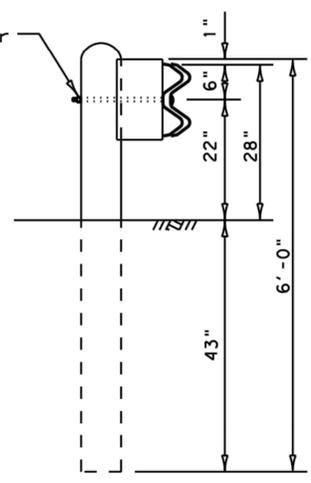
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©TxDOT January 2015 REVISIONS	CONT	SECT	JOB	HIGHWAY
	DIST	COUNTY	SHEET NO.	

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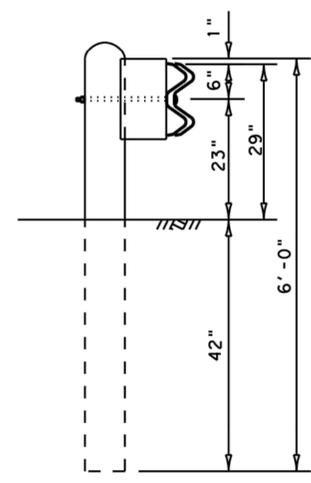
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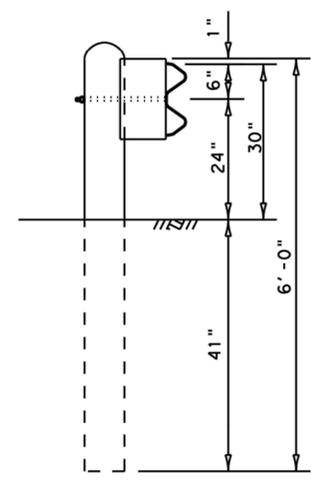
5/8" Button head post bolt with nut & washer (See General Note 3)



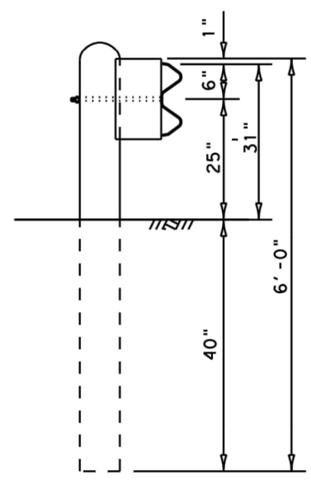
SECTION A-A



SECTION B-B



SECTION C-C



SECTION D-D

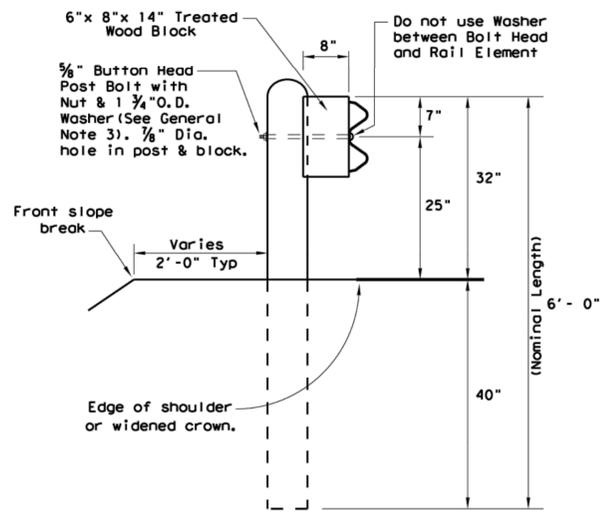
GENERAL NOTES

1. The type of post (round wood post, rectangular wood post, or steelpost) will be shown elsewhere in the plans. The exact position of transitions shall be shown elsewhere in the plans or as directed by the Engineer.
2. Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified on the plans.
3. Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and the Type A 1 3/4" O.D. washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 5/8" x 2" (at triple rail splices) with a 5/8" double recessed nuts (ASTM A563).
4. Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item requiring construction of the transition.
5. Crown will be widened to accommodate transitions.
6. If solid rock is encountered. See the GF(31)standard sheet for proper installation guidance.
7. Posts shall not be set in concrete.
8. Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT, maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL can furnish composite material posts and/or blocks.
9. Refer to GF(31) and TYPE T101 Standard Sheet for additional details.

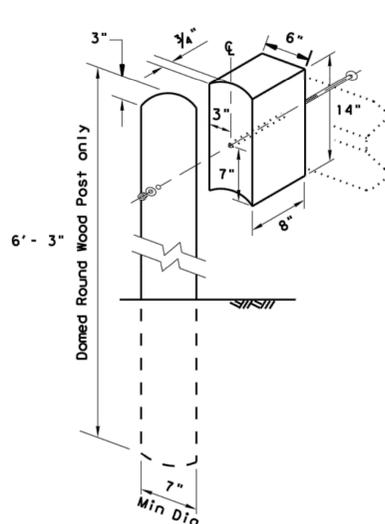
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Texas Department of Transportation		Design Division Standard	
METAL BEAM GUARD FENCE TRANSITION (T101) GF (31) T101-13			
FILE: gf31+10113	DN: AM	CK: AM	DW: VP
©TxDOT January 2013	CONT	SECT	JOB
REVISIONS	DIST	COUNTY	SHEET NO.

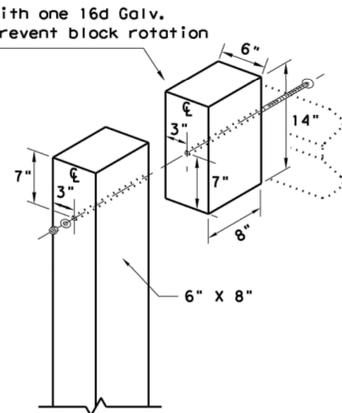
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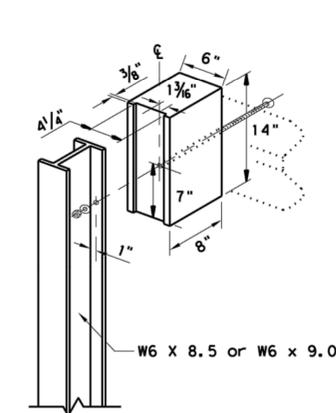
TYPICAL POST



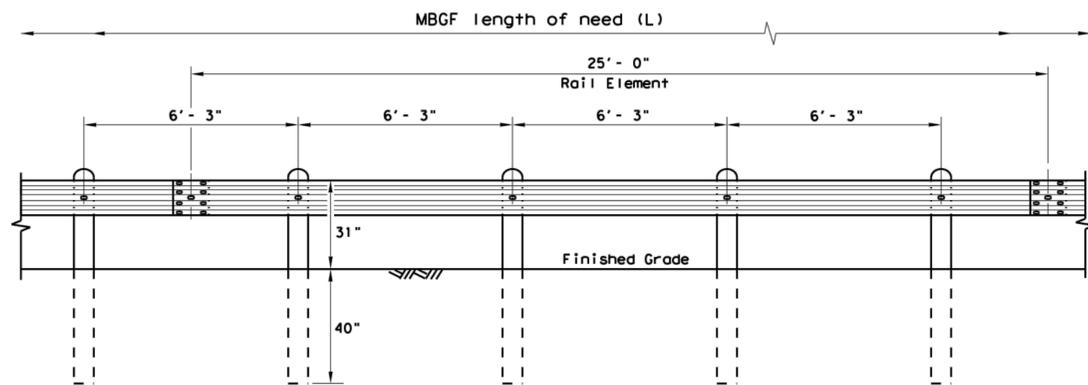
WOOD BLOCK TO ROUND WOOD POST



WOOD BLOCK TO RECTANGULAR WOOD POST



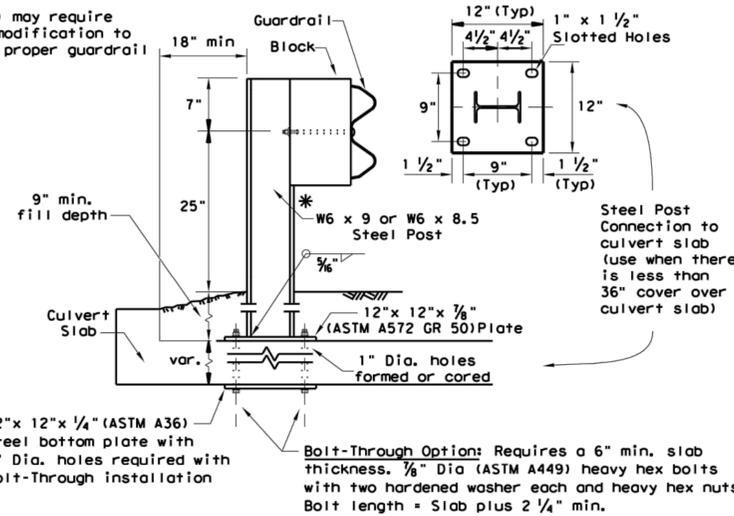
WOOD BLOCK TO STEEL POST



ELEVATION MID-SPAN RAIL SPLICE

Showing a 25'-0" section of W-Beam rail, 12'-6" rail sections may also be supplied (See General Note 2)

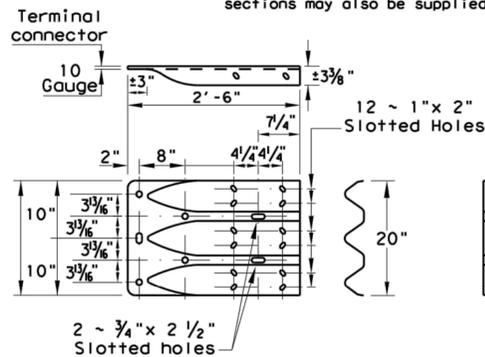
Direction of Traffic



LOW FILL CULVERT POST

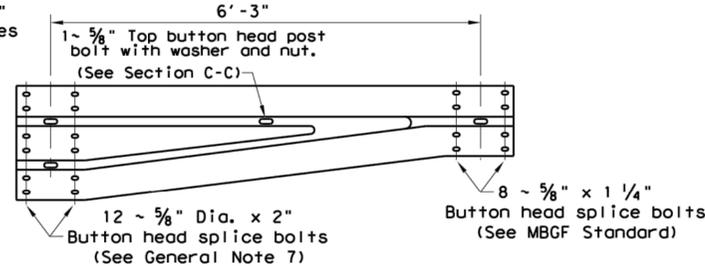
Culverts of 25 ft. or less, see GF(31)LS standard for "Long Span" option.

Epoxy Note:
 Epoxy Anchor Option: This option may only be used if the culvert slab is 8" min. thick. Threaded anchor rods must be 3/8" Dia. ASTM A449 or A193 Grade B7 with heavy hex nut, and one hardened washer each. Embed anchor rods 6" with Hilti HIT RE 500 epoxy adhesive. Other Type III Class C epoxy adhesives meeting the requirements of DMS-6100, "Epoxyes and Adhesives", may be used if it can be demonstrated that they meet or exceed the strength of Hilti HIT RE 500 with the same embedment depth and threaded rod dia. Follow the manufacturer's requirements for installing epoxied threaded rods. Extend rods 1/4" min. beyond nut.

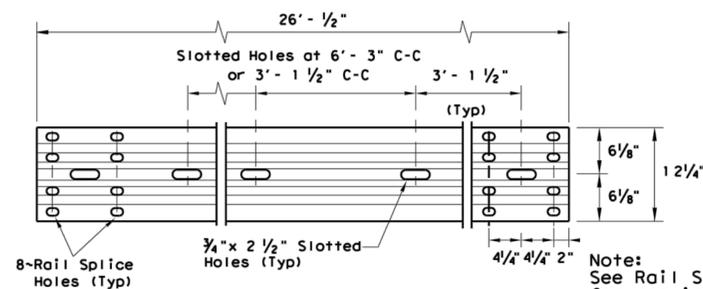


THREE-BEAM TERMINAL CONNECTION

(SEE GENERAL NOTES 6 & 7 FOR REQUIRED HARDWARE)

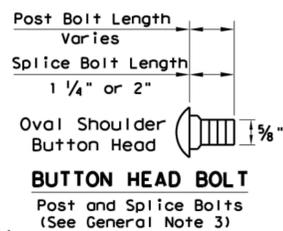


NON-SYMMETRICAL TRANSITION TO W-BEAM (10 GAUGE)



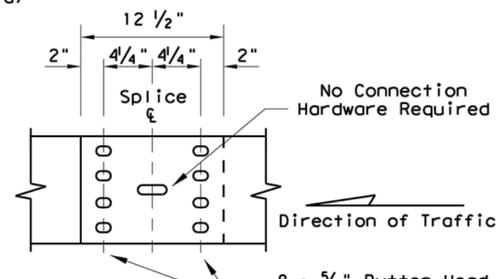
ELEVATION 25'-0" (NOM.) W-BEAM SECTION

12'-6" RAIL SECTIONS MAY ALSO BE SUPPLIED (SEE GENERAL NOTE 2)



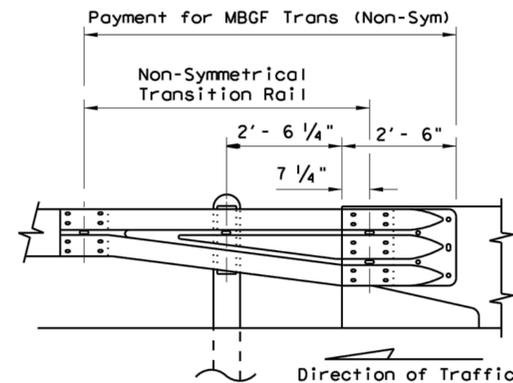
BUTTON HEAD BOLT

Post and Splice Bolts (See General Note 3)



MID-SPAN RAIL SPLICE DETAIL

Note: GF(31), Mid-Span rail splices are required with 6'-3" post spacings.



Note: All rail elements shall be lapped in the direction of adjacent traffic.

DOWNSTREAM RAIL ATTACHMENT

GENERAL NOTES

- The type of post (round wood post, rectangular wood post, or steel post) will be as shown in the plans. The exact position of MBSGF shall be shown in the plans or as directed by the Engineer. Steel posts to be galvanized in accordance with Item 445, "Galvanizing."
- Rail element shall meet the requirements of Item 540, "Metal Beam Guard Fence" except as modified in the plans. The Contractor may furnish rail elements of 25'-0", or 12'-6" (nom.) lengths. Rail elements may have slotted holes at 3'-1 1/2" C-C or 6'-3" C-C. A special length of rail may be manufactured to accommodate the downstream anchor terminal (DAT) and the transition sections of guardrail.
- Button head "post" bolts (ASTM A307) shall be of sufficient length to extend through the full thickness of the nut (ASTM A563) and Type A (1 3/4" O.D.) washer and not more than 1" beyond it. Button head "splice" bolts (ASTM A307) are 3/8" x 1 1/4" (or 2" long at triple rail splices) with a 5/8" double recessed nut (ASTM A563). Thrie beam "connection" 7/8" dia. (ASTM A325) hex bolts shall be of sufficient length to extend through the full thickness of the rail, washers, and nuts.
- Fittings (bolts, nuts, and washers) shall be galvanized in accordance with Item 445, "Galvanizing." Fittings shall be subsidiary to the bid item.
- Crown shall be widened to accommodate the Metal Beam Guard Fence.
- The lateral approach to the guard fence, shall have a maximum slope of 1V:10H.
- If shown elsewhere in the plans or as directed by the Engineer, the guard fence may be flared at a rate of 25:1 or flatter.
- Unless otherwise shown in the plans, guard fence placed in the vicinity of curbs shall be positioned so that the face of curb is located directly below or behind the face of the rail. Rail placed over curbs shall be installed so that the post bolt is located approximately 25 inches above the gutter pan or edge of shoulder.
- If solid rock is encountered within 0 to 18" of the finished grade, drill a 22" dia. hole, or drill two 12" dia. front to back overlapping holes, 24" into the rock. If solid rock is encountered below 18", drill a 12" dia. hole, 12" into the rock or to the standard embedment depth, whichever maybe less. Any excess post length, after meeting these depths, may be field cut to ensure proper guardrail mounting height. Backfill with a cohesionless material.
- Posts shall not be set in concrete, of any depth.
- Special fabrication will be required at installations having a curvature of less than 150 ft. radius.
- Unless otherwise shown in the plans, a composite material post and/or block that meets the requirements of DMS-7210, "Composite Material Posts and Blocks for Metal Beam Guard Fence" may be substituted for posts and/or blocks of similar dimensions. The Construction Division, TxDOT maintains a Material Producer List (MPL) for producers of materials conforming to DMS-7210. Only producers on the MPL may furnish composite material posts and/or blocks.
- For posts located partially or wholly between precast box culvert units, the use of a cast-in-place concrete closure between boxes is required. See Detail "A" on Bridge Standard SCP-MD.

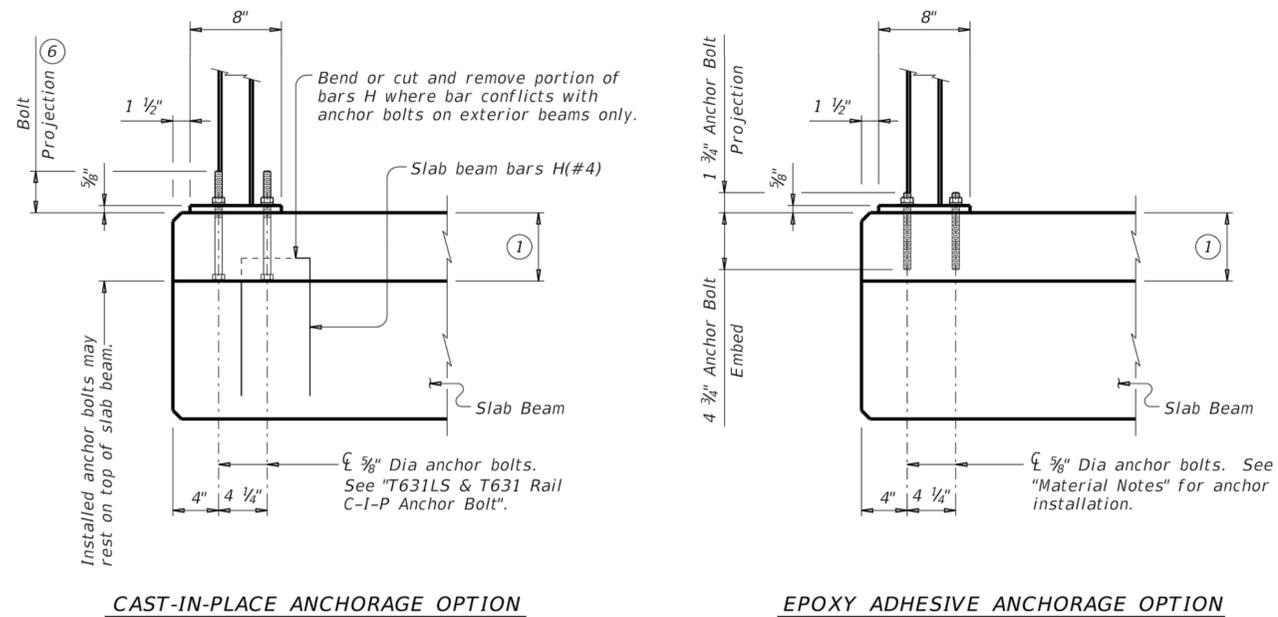
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		Design Division Standard	
<h1>METAL BEAM GUARD FENCE</h1>			
<h2>GF(31)-14</h2>			
FILE: gf3114.dgn	DN: TxDOT	CK: AM	DW: VP
© TxDOT: December 2011	CONT: REVISIONS	SECT: JOB	HIGHWAY
DIST: COUNTY	SHEET NO.		

DATE: FILE:

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T631LS & T631 RAIL ANCHORAGE PLACEMENT (2) (7)

- ① Cast-in-place slab thickness varies due to beam camber (5" minimum).
- ② Replace cast-in-place anchor bolts shown on T631LS and T631 Rail standard with an epoxy system or cast-in-place anchor bolts shown on this sheet.
- ③ Bar length shown on rail standard, minus 1 1/4". Adjust bar length for a raised sidewalk.
- ④ See rail standard for projection from finished grade or top of sidewalk.
- ⑤ Place additional (#5) longitudinal bar.
- ⑥ Excess bolt length has been provided to accommodate a variable slab thickness due to beam camber. If slab thickness on span details exceed 7", bolt length must be increased accordingly. After posts have been set and bolts tightened, bolt projection above nuts of more than 1/2" must be cut off and painted with two coats of zinc-rich paint conforming to the Item 445 "Galvanizing".
- ⑦ Distance from end of top outside edge of slab to center of first bolt group can not be less than 9", except:
15° Skew: 1'-0" (acute corner only)
30° Skew: 1'-3" (acute corner only)
- ⑧ Location of rail expansion joint must be at the intersection of centerline slab expansion joint, centerline rail footprint and perpendicular to slab outside edge.
- ⑨ Cross-hatched area must have 1/2" preformed bituminous fiber material under concrete rail, as shown.

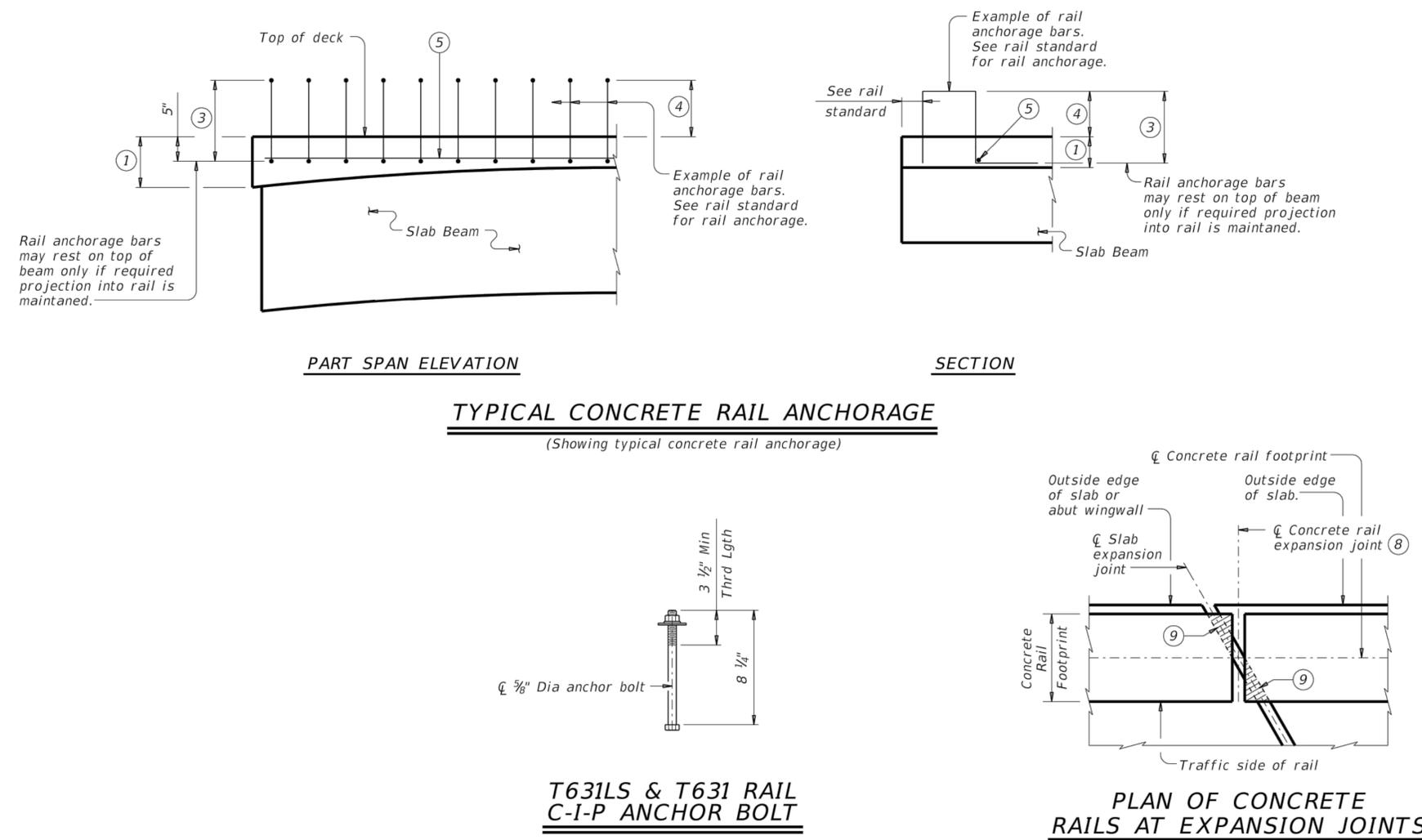
CONSTRUCTION NOTES:
Rail anchorage bars may be field bent as required to clear rail reinforcing or provide minimum cover shown on standard rail detail sheets.

MATERIAL NOTES:
Galvanize all steel components except reinforcing steel unless noted otherwise. Provide Grade 60 reinforcing.
Epoxy adhesive anchor bolts for T631LS and T631 Rail must be 5/8" Dia ASTM-A193 Gr B7 or F1554 Gr 105 fully threaded rods with one hardened washer and one regular lock washer placed under each heavy hex nut ASTM-A563. Embed threaded rods 4 3/4" Min into slab and/or abutment wingwall using a Type III, Class C, D, E, or F epoxy adhesive anchorage system capable of obtaining an ultimate load, per threaded rod, of 8 kips in tension. Submit evidence of the proposed epoxy adhesive anchorage system's ability to develop this load to the Engineer for approval prior to use. Anchor installation, including hole size, drilling, and clean-out, must be in accordance with the manufacturer's instructions.
Cast-in-place anchorage system for T631LS and T631 bridge rail must be 5/8" Dia heavy hex head anchor bolts (ASTM F3125, Gr A325 or A449) with one hardened washer and one regular lock washer placed under heavy hex nut (ASTM A563). Embed anchor bolts 4 1/2" minimum.
Epoxy coat reinforcement shown on this standard if rail reinforcement is epoxy coated.

GENERAL NOTES:
Designed in accordance with AASHTO LRFD Bridge Design Specifications. This standard is for use with structures with a 5" minimum cast-in-place concrete slab.
This standard may require modification for interior rails. This standard does not apply to median barriers.
This standard does not provide details for Type T221P, T224, T412, PR1, PR2 and PR3 rails on slab beam bridges.
See rail standards for approved speed restrictions, notes and shown.

Cover dimensions are clear dimensions, unless noted otherwise.

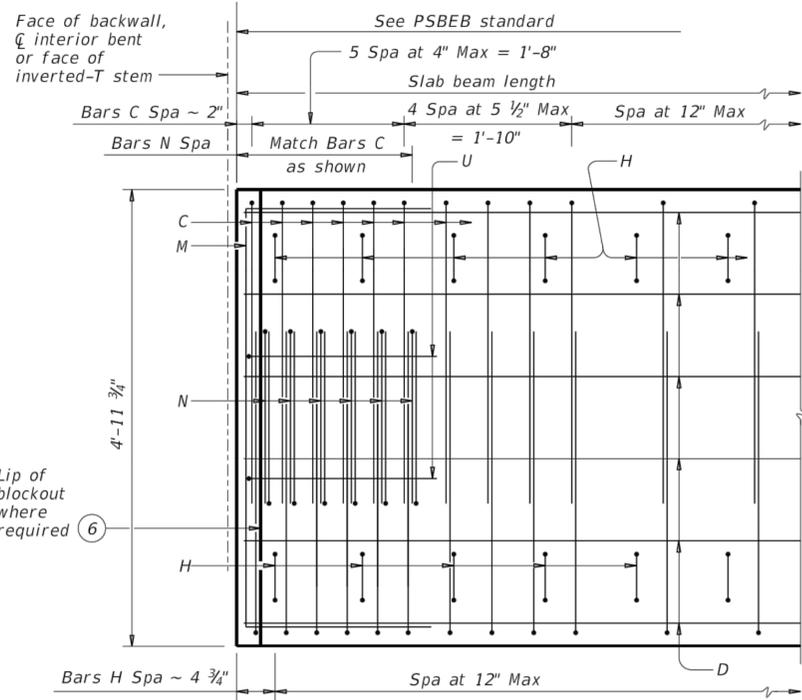
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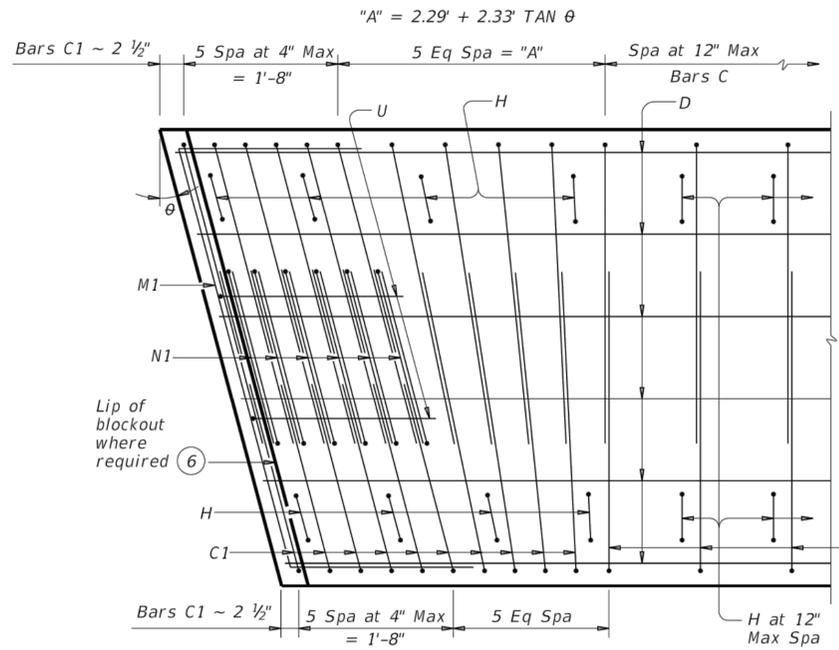
		Bridge Division Standard	
<h2>RAIL ANCHORAGE DETAILS</h2>			
<h3>PRESTR CONCRETE SLAB BEAMS</h3>			
<h3>PSBRA</h3>			
FILE: pbsste07-17.dgn	DN: TxDOT	CK: TxDOT	DW: JTR
©TxDOT January 2017	CONT	SECT	JOB
REVISIONS			HIGHWAY
	DIST	COUNTY	SHEET NO.

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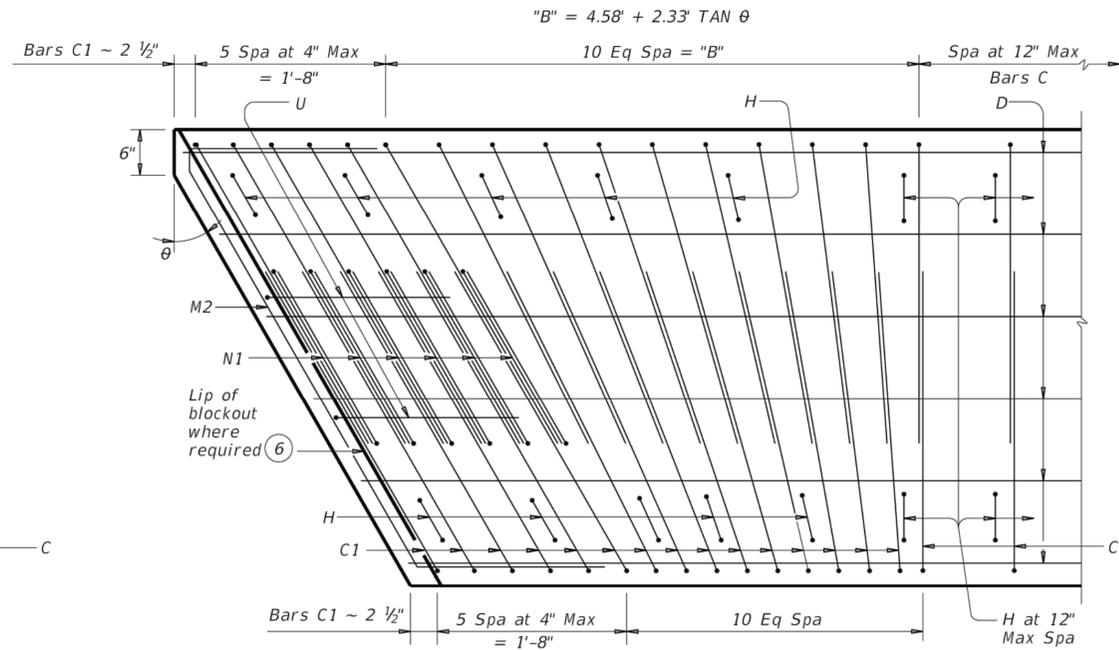
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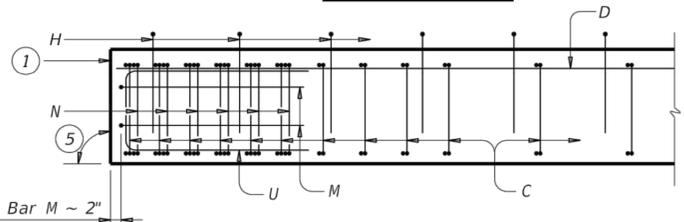
PART PLAN



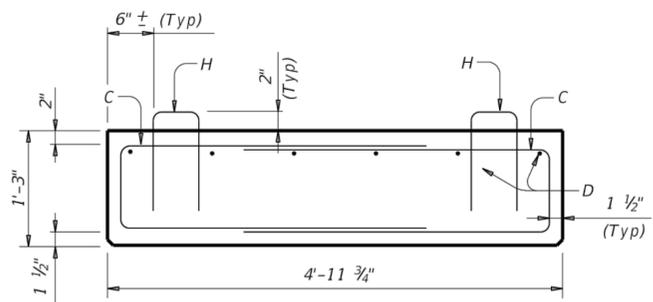
PART SKEW PLAN
(Showing θ over 0° to 15° skew)



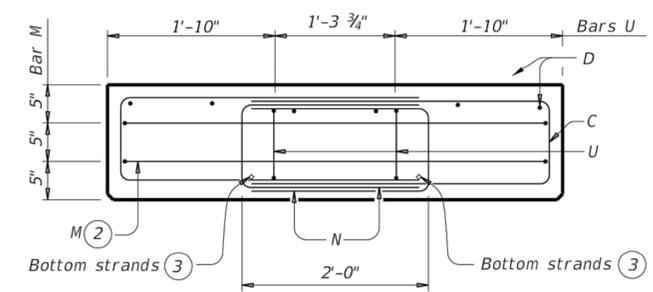
PART SKEW PLAN
(Showing θ over 15° to 30° skew)



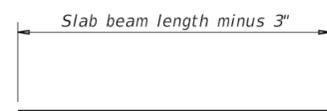
ELEVATION



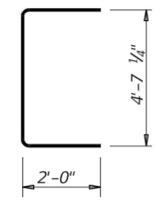
SECTION



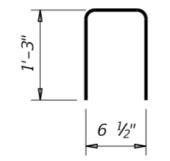
END MAT REINFORCING
Bars H not shown for clarity.



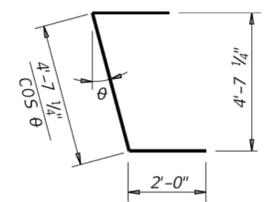
BARS D(#6)



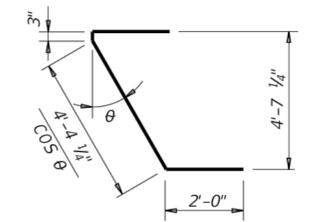
BARS M(#4)



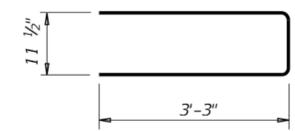
BARS H(#4)



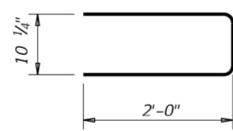
BARS M1(#4)



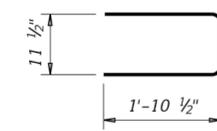
BARS M2(#4)



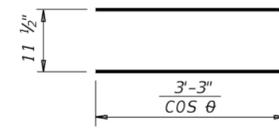
BARS C(#4)



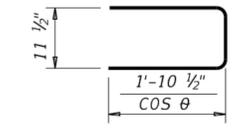
BARS U(#5)



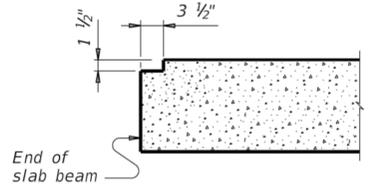
BARS N(#4)



BARS C1(#4)



BARS N1(#4)



ELEVATION OF BLOCKOUT

BEAM PROPERTIES		
Area	in ²	896.2
Y top	in	7.50
Y bott	in	7.50
I	in ⁴	16,805
Weight	lb/ft	934

GENERAL NOTES:
 Designed according to AASHTO LRFD Bridge Design Specifications.
 Provide Class H concrete. Provide Class H (HPC) if shown elsewhere in the plans.
 Provide Grade 60 reinforcing steel.
 An equal area of welded wire reinforcement (WWR) (ASTM 1064) may be substituted for bars C and D if approved by the Engineer.
 These details can be used for any skew angle up to a maximum of 30 degrees.
 Chamfer all exposed corners 3/4" or round to a 3/4" radius.
 Details are drawn showing right forward skew. See Bridge Layout for actual direction.

Cover dimensions are clear dimensions, unless noted otherwise.
 Reinforcing bar dimensions shown are out-to-out of bar.

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- See End Mat Reinforcing detail.
- Adjust bars M vertically to avoid strands.
- See sheet PSBND or PSBSD for strand locations.
- Assumes 150 pcf weight density of concrete.
- 90° at conventional interior bents. End of beam must be vertical at abutment backwall and inverted-T stem.
- Blockout required at armor joint (AJ) and sealed expansion joint (SEJ) locations to accommodate joint anchorage.

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 Bridge Division Standard

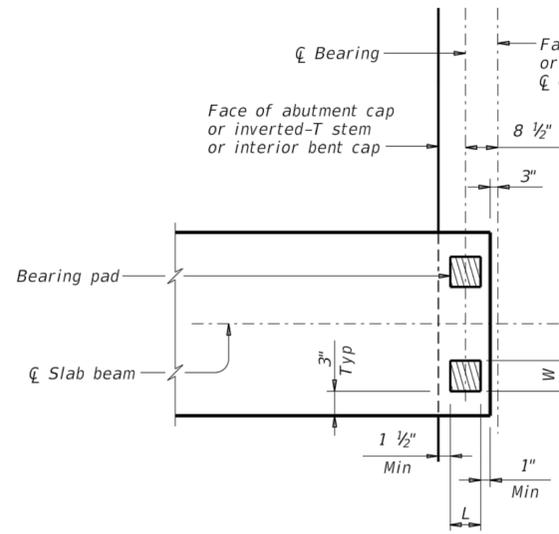
PRESTRESSED CONCRETE SLAB BEAM DETAILS
 (TYPE 5SB15)

PSB-5SB15

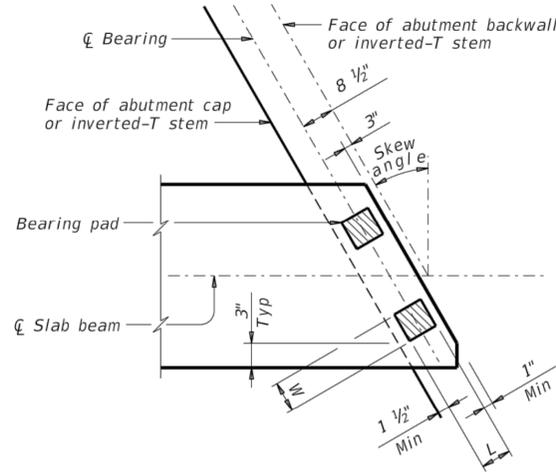
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©TxDOT January 2017	CONT	SECT	JOB	HIGHWAY
REVISIONS				
DIST	COUNTY			SHEET NO.

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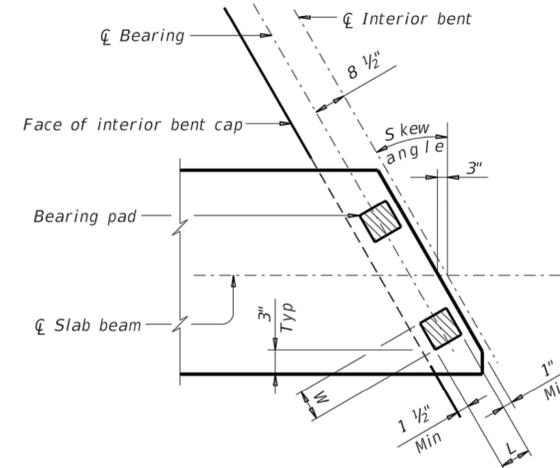
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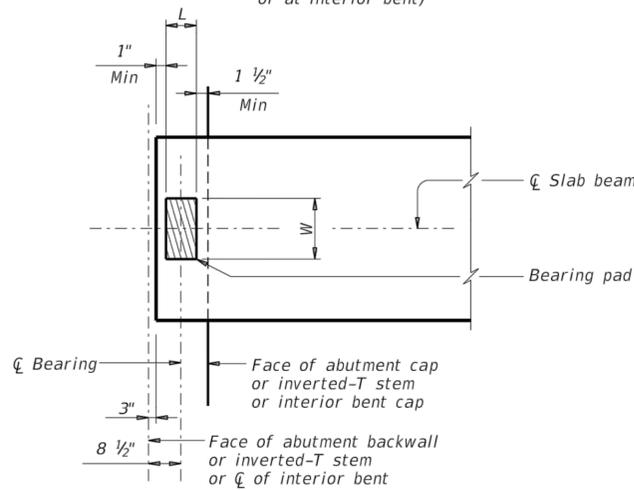
TWO-PAD DETAIL PLAN
(At abutment or inverted-T cap or at interior bent)



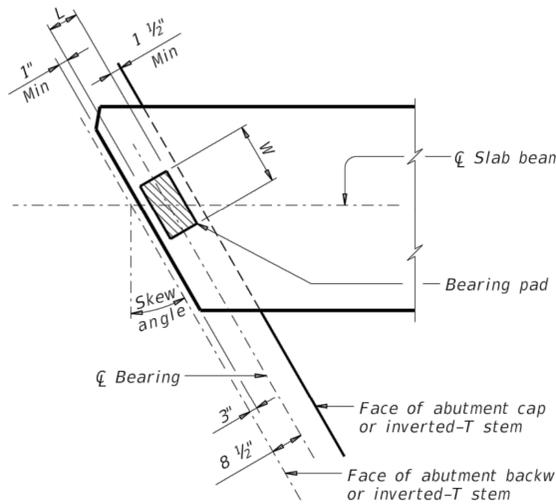
TWO-PAD DETAIL SKEW PLAN
(At abutment or inverted-T cap)



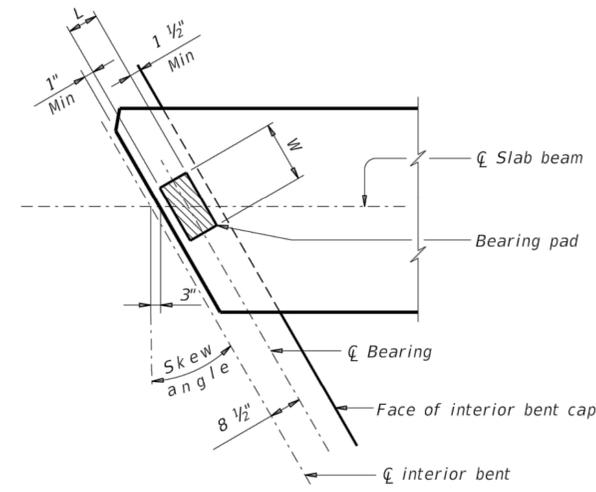
TWO-PAD DETAIL SKEW PLAN
(At interior bent)



ONE-PAD DETAIL PLAN
(At abutment or inverted-T cap or at interior bent)



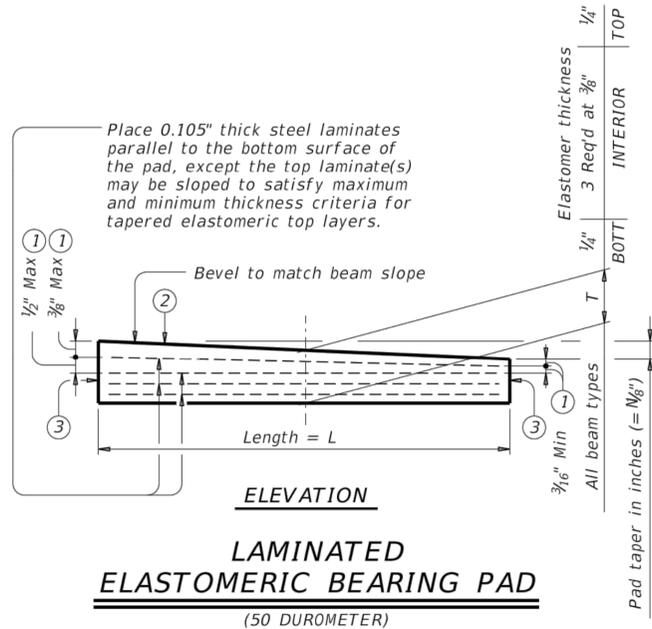
ONE-PAD DETAIL SKEW PLAN
(At abutment or inverted-T cap)



ONE-PAD DETAIL SKEW PLAN
(At interior bent)

ELASTOMERIC BEARING PAD PLACEMENT AND BEAM END DIAGRAMS

Place one bearing pad at forward station beam end.
Place two bearing pads at back station beam end.



LAMINATED ELASTOMERIC BEARING PAD
(50 DUROMETER)

- Maximum and minimum layer thicknesses shown are for elastomer only, on tapered layers.
- Indicate BEARING TYPE on all pads. For tapered pads, locate BEARING TYPE on the high side. The Fabricator must include the value of "N" (amount of taper in 1/8" increments) in this mark. Examples: N=0, (for 0" taper) N=1, (for 1/8" taper) N=2, (for 1/4" taper) (etc.) Fabricated pad top surface slope must not vary from plan beam slope by more than $(\frac{0.0625"}{Length})$ IN/IN.
- Locate permanent mark here.

TABLE OF BEARING PAD DIMENSIONS (ALL PRESTR CONC SLAB BM TYPES)

One-Pad (Ty SB1-"N") (2)			Two-Pad (Ty SB2-"N") (2)		
W	L	T	W	L	T
14"	7"	2"	7"	7"	2"

Pad sizes shown are applicable for the following conditions:

- All one, two and three span units where the minimum span length is not less than 25' and the maximum span is not more than 50'.
- Skews less than or equal to 30°.

GENERAL NOTES:

These details accommodate skew angles up to 30°. Shop drawings for approval are required. A bearing layout which identifies location and orientation of all bearings must be developed by the bearing fabricator. Permanently mark each bearing in accordance with the bearing layout. A copy of the bearing layout is to be provided to the Engineer. Cost of furnishing and installing elastomeric bearings must be included in unit price bid for "Prestressed Concrete Slab Beams".

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ELASTOMERIC BEARING AND BEAM END DETAILS

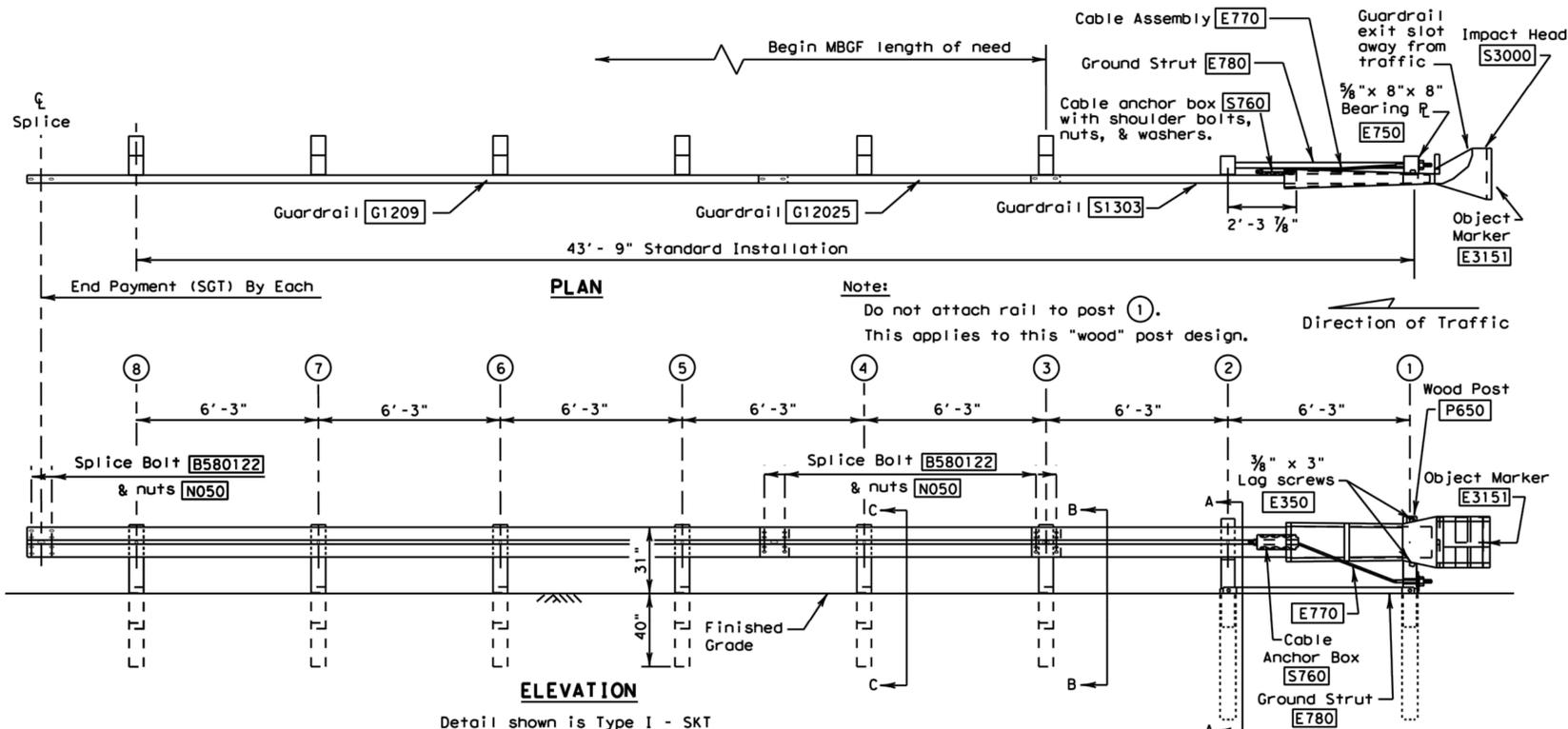
PRESTR CONCRETE SLAB BEAM

PSBEB

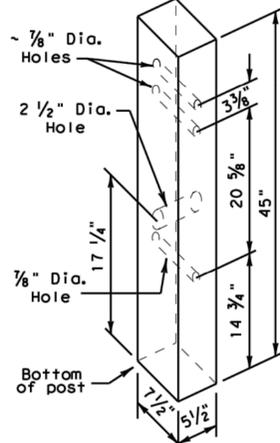
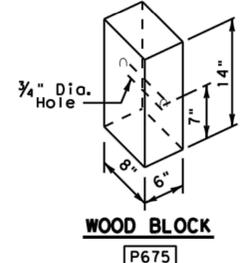
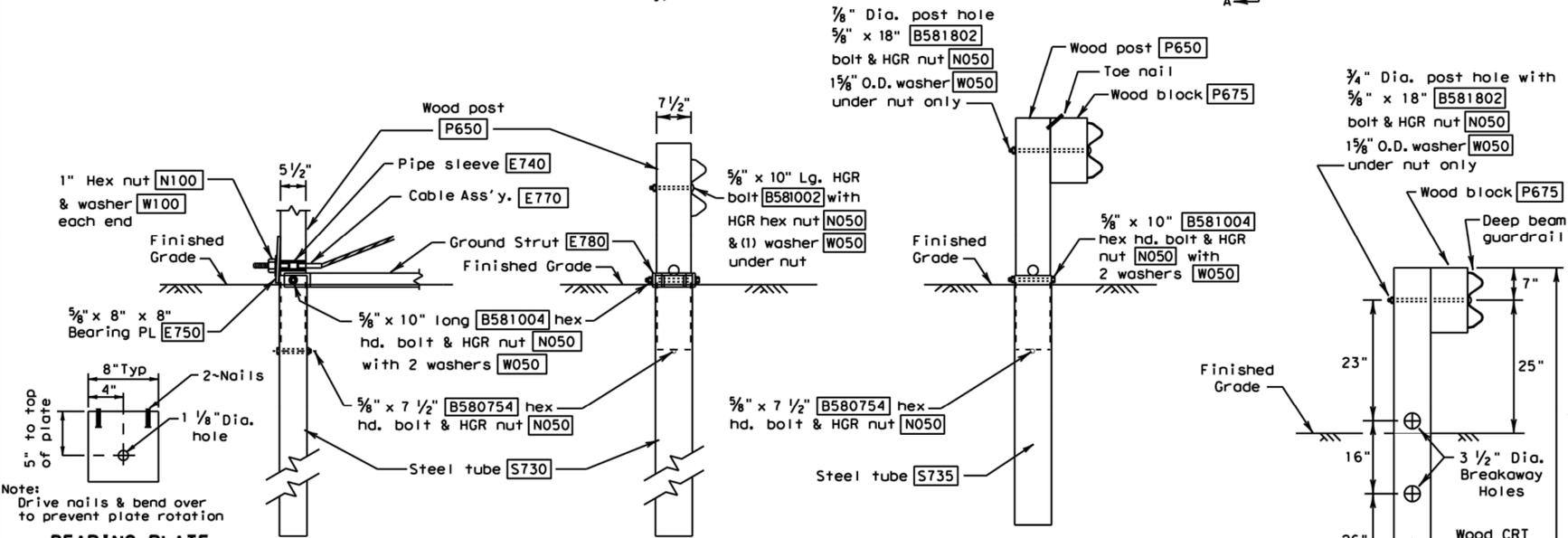
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Detail shown is Type I - SKT



All measurements should be taken from bottom of posts.

UNIVERSAL WOOD POST

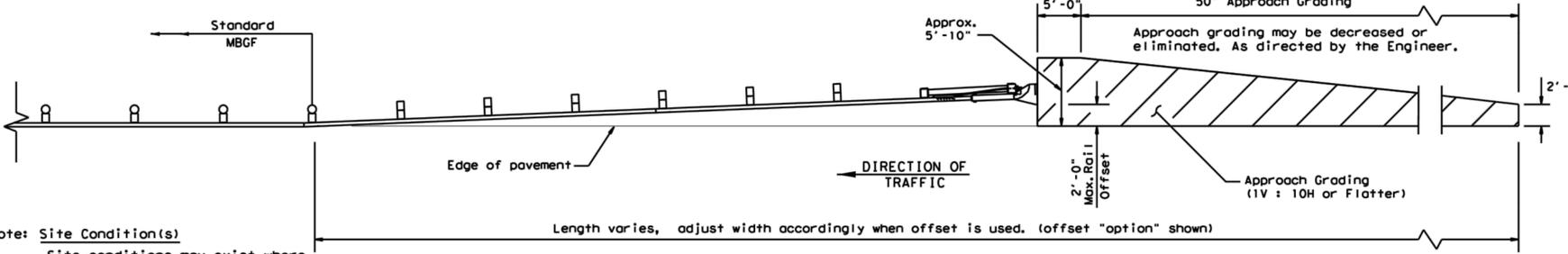
POST & TUBE OPTIONS	
Type I	post ① thru ②
Type II	post ① thru ④
Type III	post ① thru ⑧

GENERAL NOTES

- For additional information contact: Interstate Steel Inc. (432) 263-3725
- The Type of SGT unit will be specified elsewhere in the plans. The numbers in the circles indicate post position. The Type of SGT unit chosen is a maintenance consideration and does not affect the systems performance.

Post & Tube Options		Post Only	
Type I Posts	① thru ②	Posts ③ thru ⑧	
Type II Posts	① thru ④	Posts ⑤ thru ⑧	
Type III Posts	① thru ⑧	None	
- SGT's placed within the "minimum" 150 ft. radius, shall be installed straight. Standard rail elements may be installed within the radius, without special fabrication.
- All bolts, nuts cable assemblies, cable anchors, steel tubes & bearing plates shall be galvanized.
- A flare rate of 25:1 may be used over the first 50 ft. of the system to prevent the terminal head from encroaching the shoulder. The flare may be decreased or eliminated for specific installations, if directed by the Engineer.
- The steel tubes shall not protrude more than 4 inches above ground. Site grading may be necessary to meet this requirement.
- The steel tubes may be driven with an approved driving head. They shall not be driven with the wood post in the tube. If the steel tubes are placed in drilled holes, the backfill material must be satisfactorily compacted to prevent tube settlement.
- If solid rock is encountered. See the Manufacturer's installation manual for the proper installation guidance.
- The breakaway cable assembly must be taut. A locking device, (vice grips or channel lock pliers) should be used to prevent the cable from twisting when tightening the nuts.
- The wood blocks shall be "toe nailed" to the rectangular wood posts to prevent them from turning when the wood shrinks. The bearing plate on the front post shall also be "toe nailed" to prevent rotation.
- For curb installations, the soil tubes and posts shall be installed at the proper ground elevation behind the curb. The posts will then require field drilling new holes to accommodate the rail to post connection bolt to maintain the proper height of the rail above the gutter pan. The excess post length above the rail will be removed if directed by the Engineer.
- An object marker shall be installed on the front of the impact head as detailed on D&OM(VIA).

Item #	POST & TUBE OPTIONS			DESCRIPTION
	Type I	Type II	Type III	
S1303	1	1	1	Guardrail (12 Ga.) 12' - 6" SKT
G12025	1	1	1	Guardrail (12 Ga.) 9' - 4 1/2"
G1209	1	1	1	Guardrail (12 Ga.) 25' - 0"
S730	2	2	2	Steel Tube - 6" x 8" x 72" x 1/8" min. or 3/16"
S735	0	2	6	Steel Tube - 6" x 8" x 54" x 1/8" min. or 3/16"
P650	2	4	8	Wood Posts - 5 1/2" x 7 1/2" x 45"
P671	6	4	0	Wood CRT Posts - 6" x 8" x 72"
P675	6	6	6	Wood Block - 6" x 8" x 14"
E740	1	1	1	Pipe Sleeve - 2" Std. Pipe x 5 1/2"
E750	1	1	1	Bearing Plate - 5/8" x 8" x 8"
S760	1	1	1	Cable Anchor Box
E770	1	1	1	Cable Assembly
E780	1	1	1	Ground Strut
S3000	1	1	1	Impact Head
HARDWARE				
B580754	2	4	8	5/8" x 7 1/2" Hex Hd. Bolt
B581004	2	4	8	5/8" x 10" Hex Hd. Bolt (Top of Tubes)
W050	11	15	23	3/8" Washers
B581002	1	1	1	5/8" x 10" HGR Post Bolt (Post 2)
B580122	16	16	16	5/8" x 1 1/4" HGR Splice Bolt
B581802	6	6	6	5/8" x 18" HGR Post Bolt (Posts 3 thru 8)
N050	35	39	47	3/8" HGR Nut (24-Spl, Varies-Post)
E350	2	2	2	3/8" x 3" Lag Screw
N100	2	2	2	1" Hex Nut (Anchor Cable)
W100	2	2	2	1" Washer (Anchor Cable)
SB12A	8	8	8	Cable Anchor Box Shoulder Bolts
N012A	8	8	8	1/2" Structural Nut
W012A	8	8	8	1/2" Structural Washer
E3151	1	1	1	Object Marker - (18" x 18")



APPROACH GRADING AT GUARDRAIL END TREATMENTS

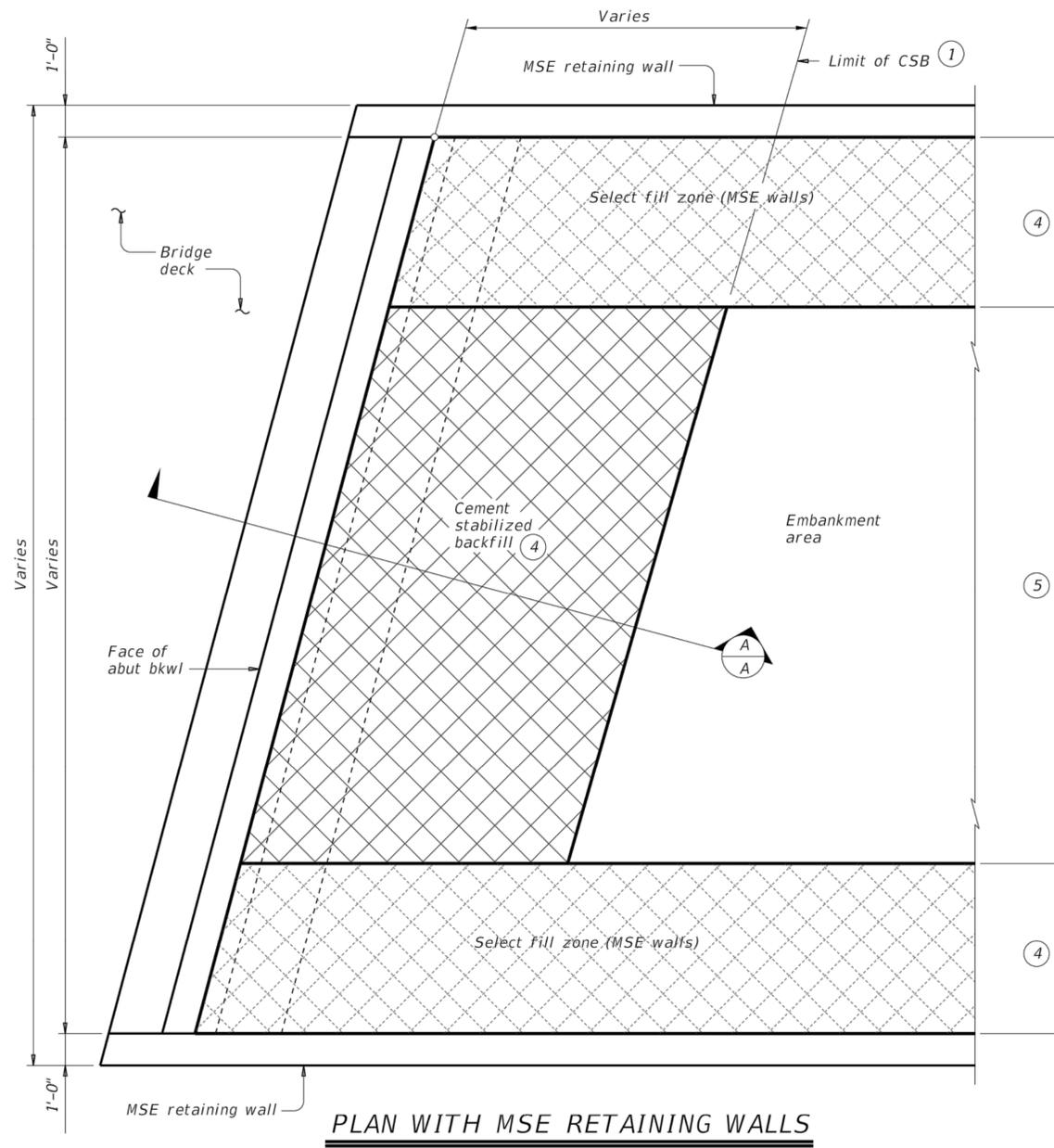
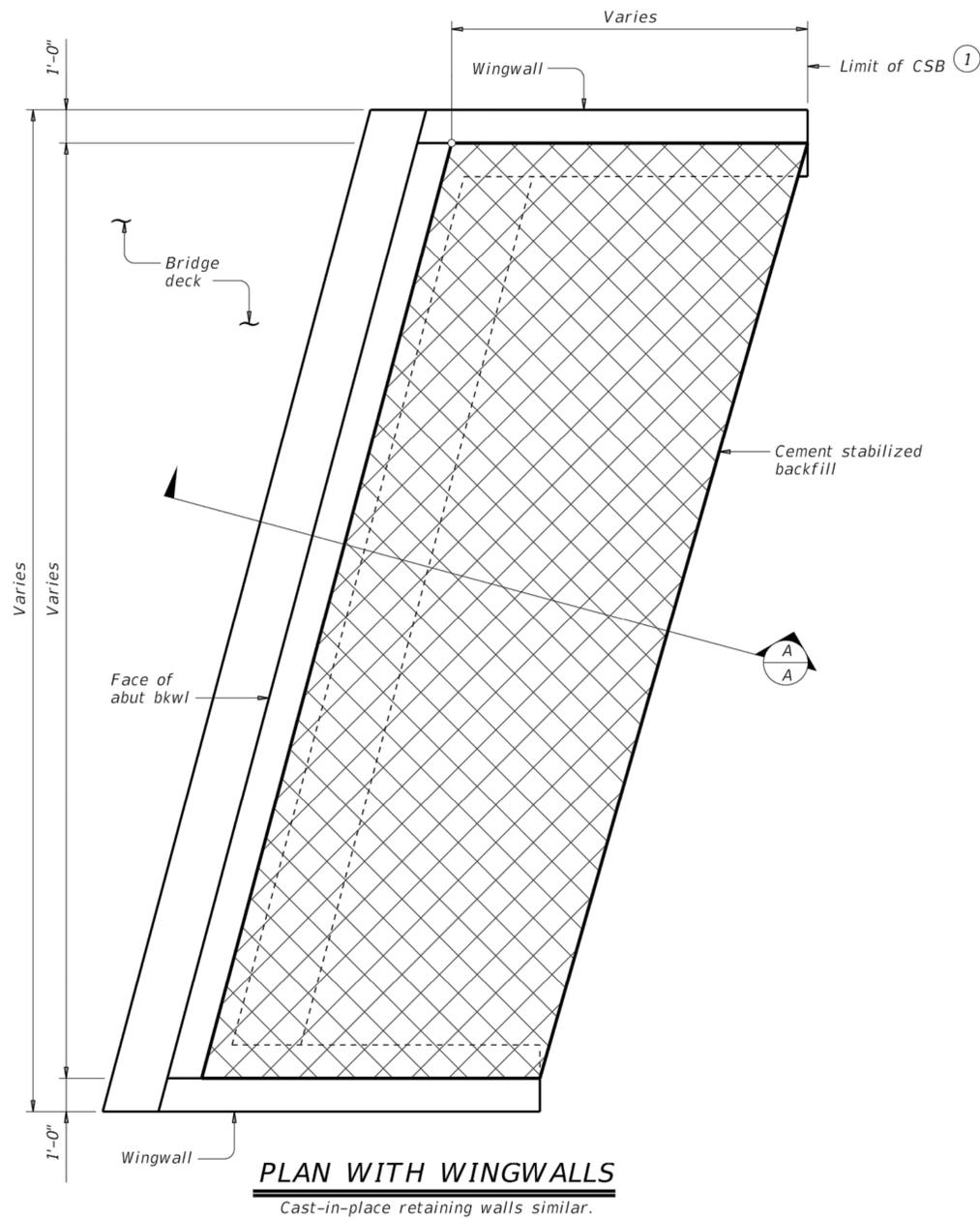
Design Division Standard

SINGLE GUARDRAIL TERMINAL (SKT-31) (WOOD POST)

SGT (8) 31-14

FILE: sgt83114.dgn	DN: TxDOT	CK: AM	DW: BD/VP	CK: VP
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REVISIONS	DIST	COUNTY	SHEET NO.	

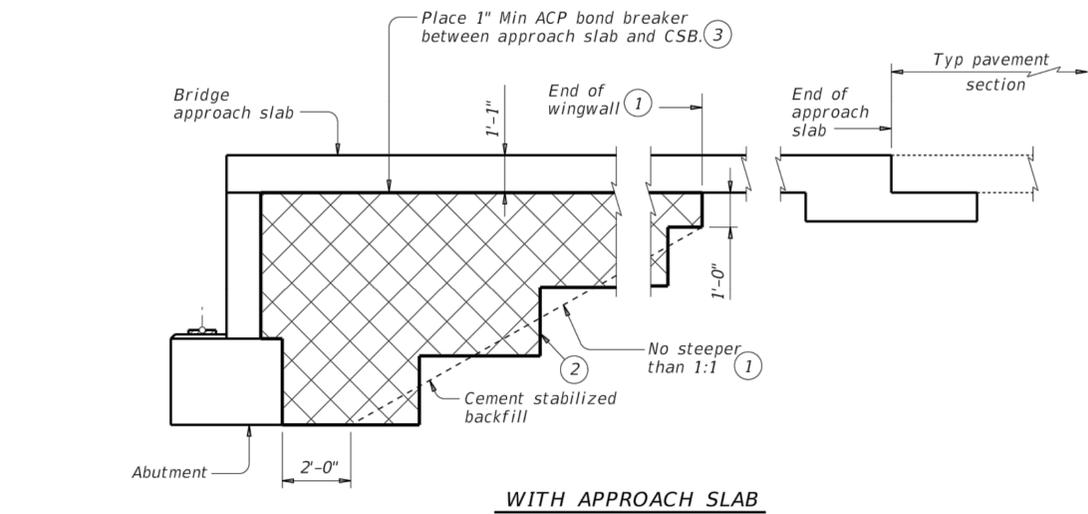
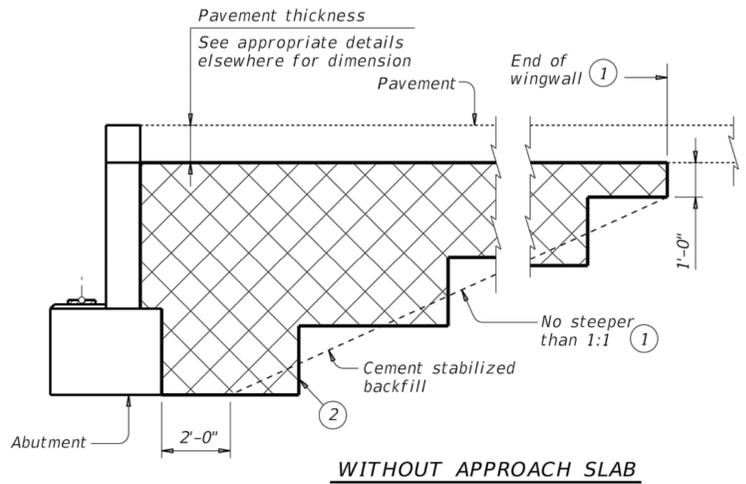
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- ① Usual limit of Cement Stabilized Backfill is at end of wingwall. Extend CSB limits as required to maintain a slope no steeper than 1:1 at bottom of backfill.
- ② Bench backfill as shown with 12" (approximate) bench depths.
- ③ Other materials can be used as a bond breaker if permitted by the Engineer. 2 layers of 30 Lb roofing felt or 2 layers of heavy mil polyethylene sheeting are examples.
- ④ Where MSE retaining walls are present, adjust CSB limits to accommodate the select fill zone. See retaining wall details for additional information.
- ⑤ When distance between select fill zones is less than 5'-0", MSE select fill may be substituted for cement stabilized backfill with approval from the Engineer.

GENERAL NOTES:
Provide Cement Stabilized Backfill (CSB) meeting the requirements of Item 400, "Excavation and Backfill for Structures", to the limits shown at bridge abutments.
Details are drawn showing left forward skew. See Bridge Layout for actual skew direction.
These details do not apply when Concrete Block retaining walls are used in lieu of CSB.

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SECTION A-A

Texas Department of Transportation Bridge Division Standard

CEMENT STABILIZED ABUTMENT BACKFILL BRIDGE ABUTMENT

CSAB

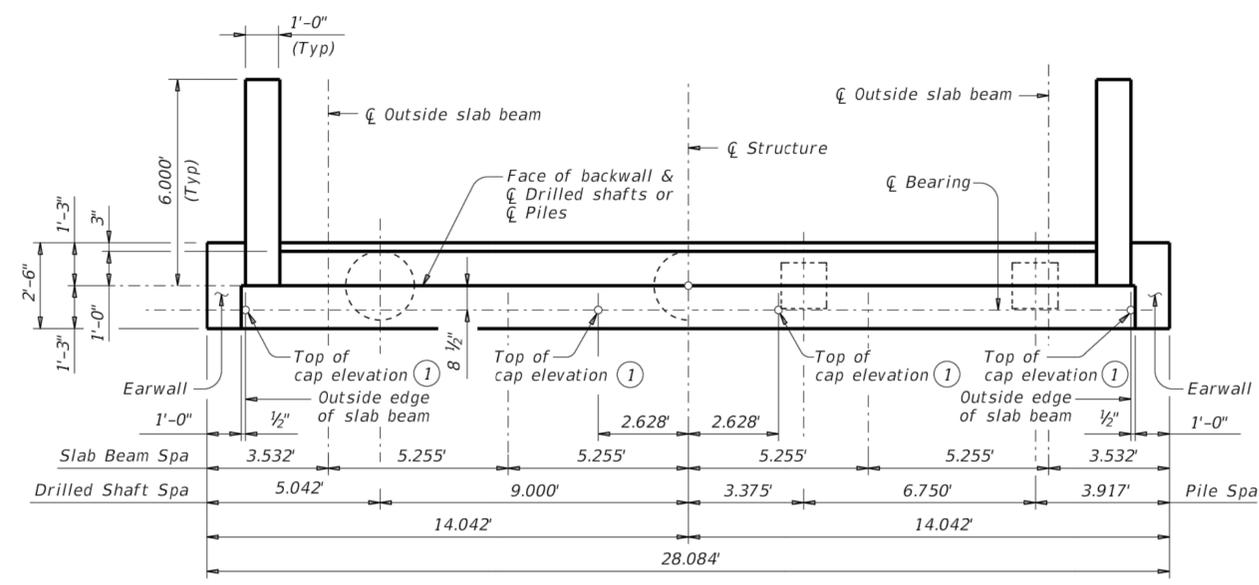
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©TxDOT January 2015	CONT	SECT	JOB	HIGHWAY
REVISIONS				
01-16: Add MSE wall details.				
DIST	COUNTY		SHEET NO.	

DATE: FILE:

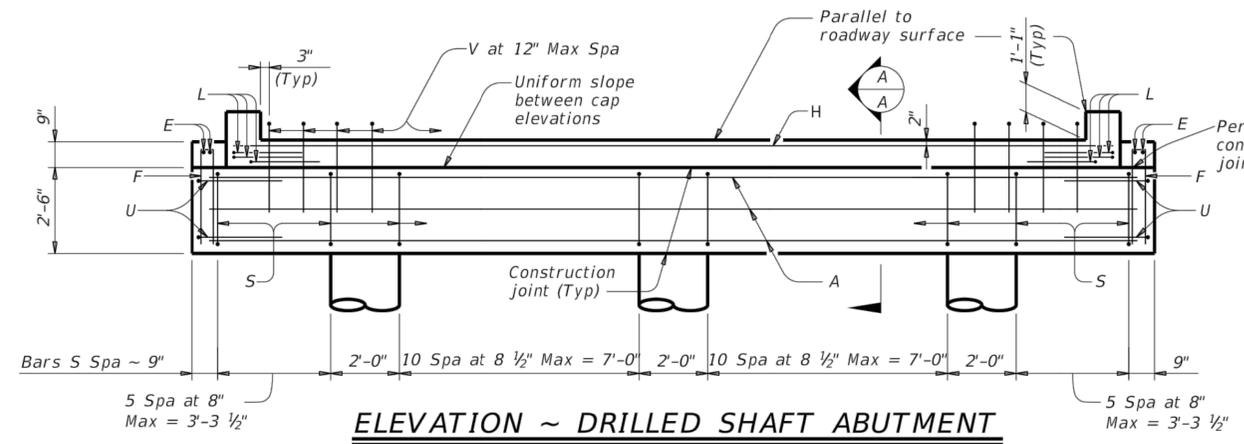
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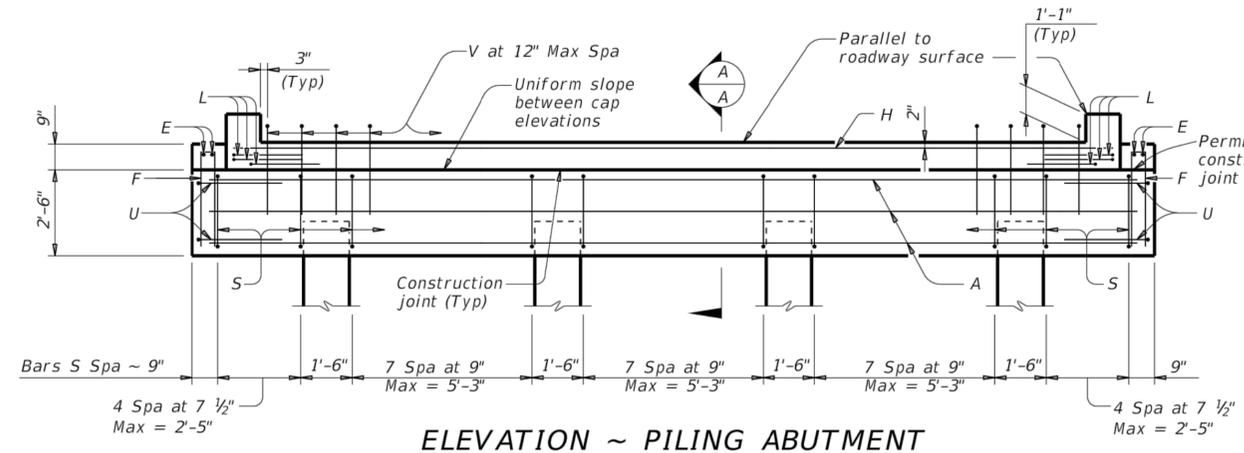
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SHOWING DRILLED SHAFTS PLAN SHOWING PILES

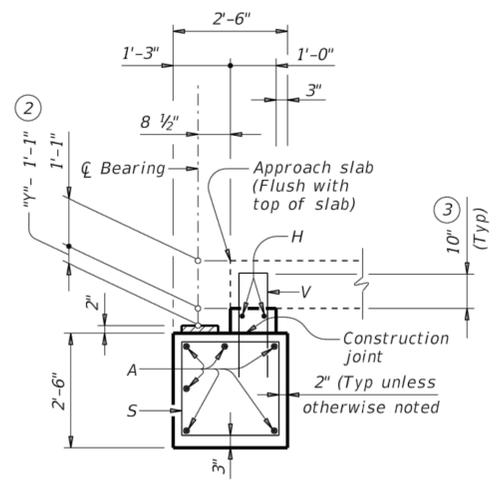
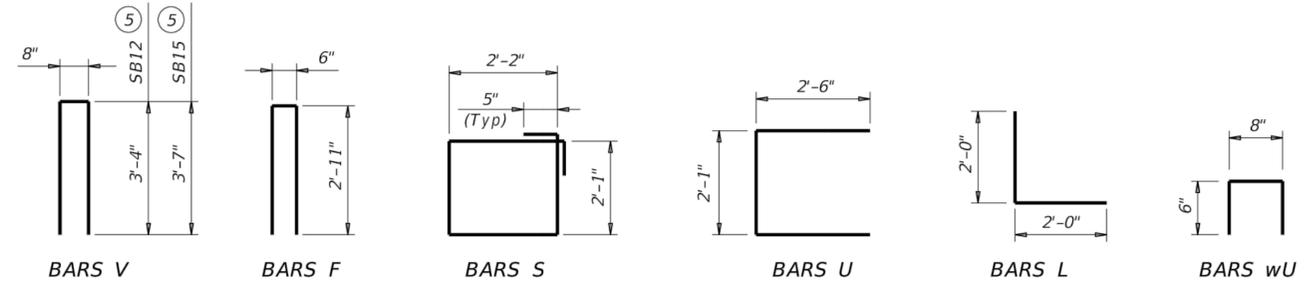


ELEVATION ~ DRILLED SHAFT ABUTMENT



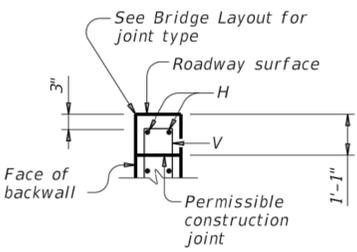
ELEVATION ~ PILING ABUTMENT

Note: For piles larger than 16", adjust Bars S spacing as required to avoid piles.



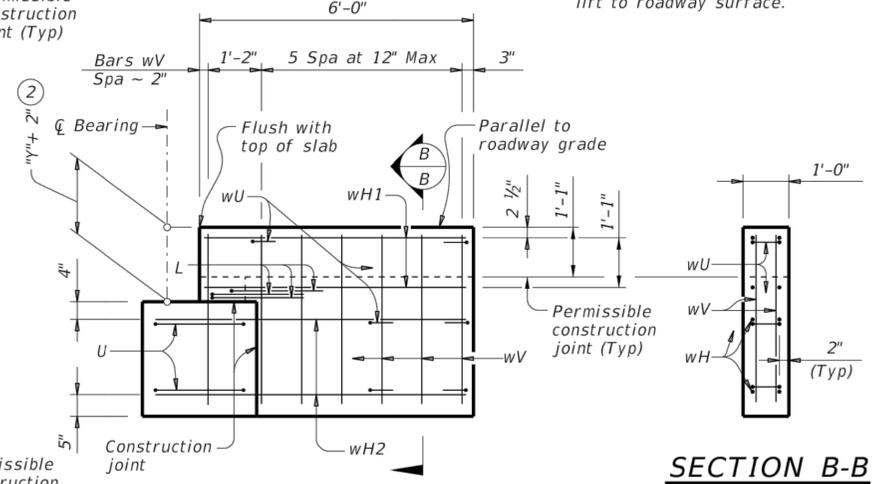
SECTION A-A

(With approach slab)
Note: At Contractor's option, backwall may be cast with approach slab.



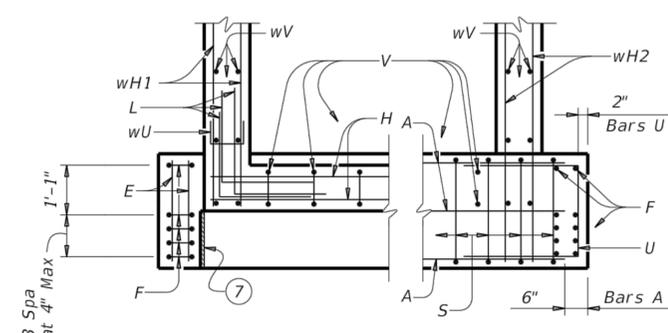
BACKWALL DETAIL

(Without approach slab)
Note: At Contractor's option, backwall may be cast in one lift to roadway surface.



WINGWALL ELEVATION

(Earwall not shown for clarity.)



BACKWALL CAP CORNER DETAILS

FOUNDATION LOADS				
Span Length	Drilled Shaft Loads		Vertical Pile Loads	
	5SB12	5SB15	5SB12	5SB15
Ft	Tons/DS	Tons/DS	Tons/Pile	Tons/Pile
25	39	41	29	31
30	43	46	33	34
35	48	51	36	38
40	52	55	39	41
45	59		44	
50	63		47	

TABLE OF ESTIMATED QUANTITIES						
Bar	No.	Size	Length (5)		Weight (5)	
			5SB12	5SB15	5SB12	5SB15
A	6	#11	27'-1"	27'-1"	863	863
E	4	#4	2'-2"	2'-2"	6	6
F	10	#4	6'-4"	6'-4"	43	43
H	2	#5	25'-8"	25'-8"	54	54
L	6	#6	4'-0"	4'-0"	36	36
S	34	#4	9'-4"	9'-4"	212	212
U	4	#6	7'-1"	7'-1"	43	43
V	25	#5	7'-4"	7'-10"	191	204
wH1	8	#6	5'-8"	5'-8"	68	68
wH2	8	#6	6'-11"	6'-11"	83	83
wU	12	#4	1'-8"	1'-8"	14	14
wV	28	#5	3'-10"	4'-1"	112	119
Reinforcing Steel			Lb		1,725	1,745
CI "C" Conc (Abut)			CY		8.8	9.2

- Top of cap elevations are based on section depths shown on Span Details.
- See Span Details for "Y".
- Increase as required to maintain 3" from finished grade.
- See Bridge Layout to determine if approach slab is present.
- See Bridge Layout for beam type used in the superstructure.
- Quantities shown are for one abutment only (with approach slab). Without approach slab, add 1.0 CY Class "C" concrete and 54 Lb reinforcing steel for 2 additional Bars H.
- 1/2" preformed bituminous fiber material between slab beam and earwall. Bond to earwall with an approved adhesive. Cast inside face of earwall perpendicular to cap. (Typ)

GENERAL NOTES:
Designed according to AASHTO LRFD Bridge Design Specifications.
Designed for a normal embankment header slope of 3:1 and a maximum span length of 50 feet.
See Bridge Layout for header slope and foundation type, size, and length.
See Common Foundation Details (FD) standard sheet for all foundation details and notes.
See Concrete Riprap (CRR) standard sheet or Stone Riprap (SRR) standard sheet for riprap attachment details, if applicable.
See applicable rail details for rail anchorage in wingwalls.
These abutment details may be used with standard SP5B-24 only.

MATERIAL NOTES:
Provide Class C concrete (f'c = 3,600 psi)
Provide Class C (HPC) concrete if shown in the plans.
Provide Grade 60 reinforcing steel.

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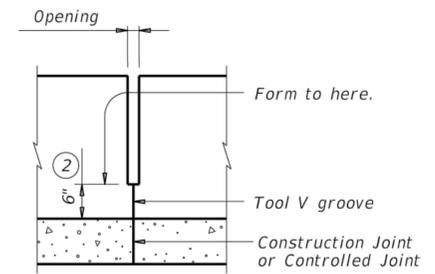
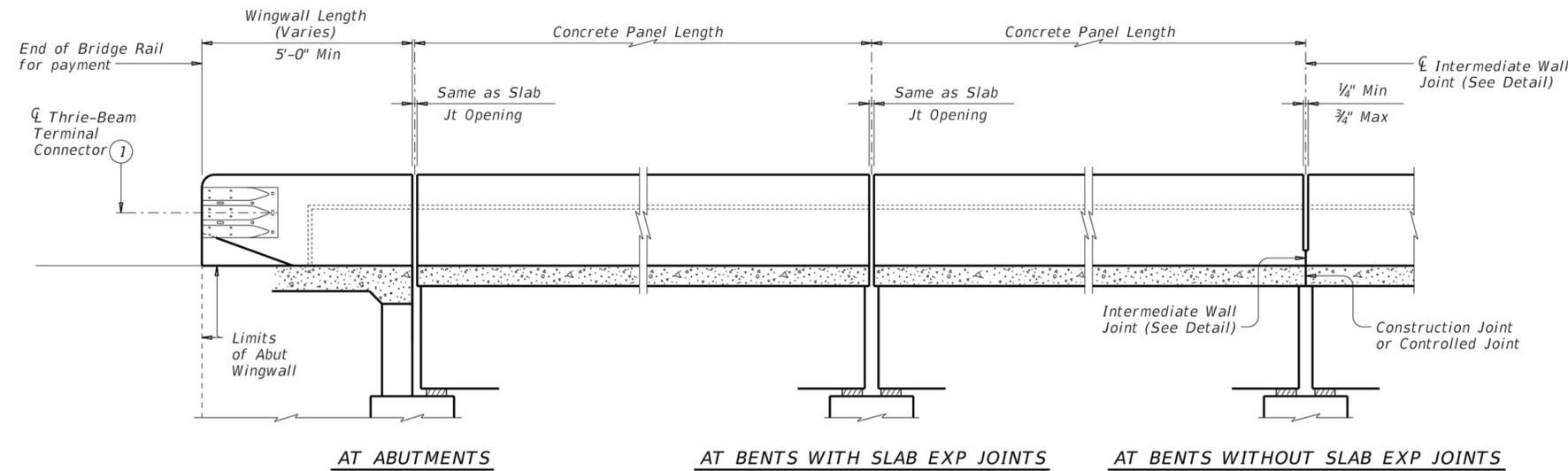
Texas Department of Transportation Bridge Division Standard

ABUTMENTS
PRESTR CONCRETE SLAB BEAM
24' ROADWAY

APSB-24

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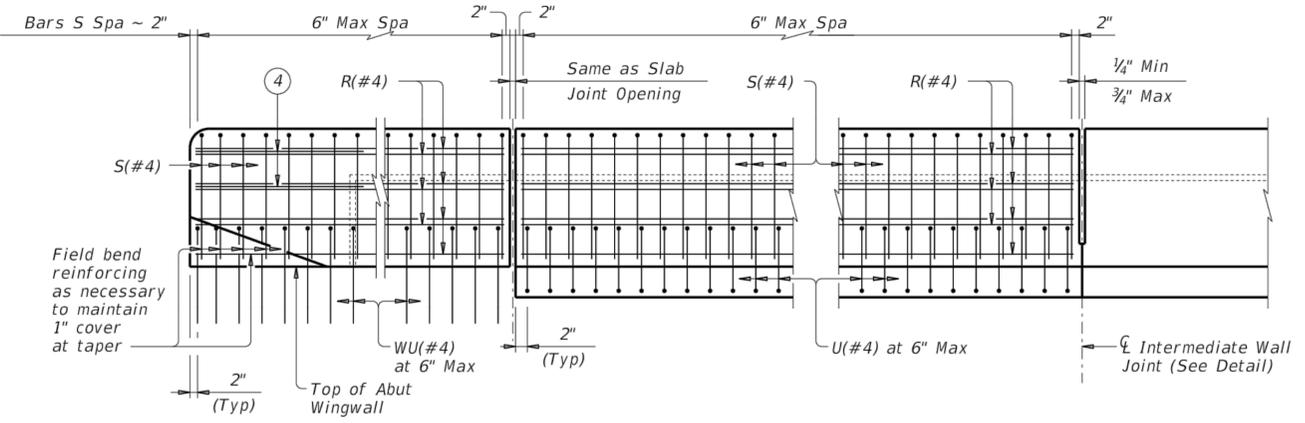


INTERMEDIATE WALL JOINT DETAIL
Provide at all interior bents without slab expansion joints.

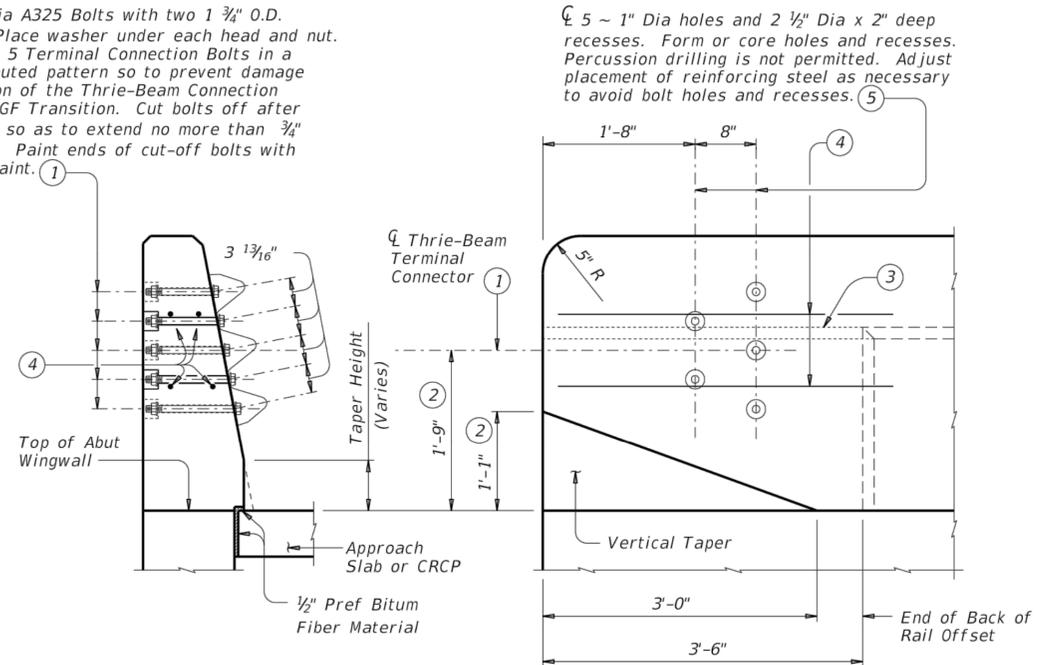
ROADWAY ELEVATION OF RAIL

5 ~ 7/8" Dia A325 Bolts with two 1 3/4" O.D. washers. Place washer under each head and nut. Tighten the 5 Terminal Connection Bolts in a well distributed pattern so to prevent damage or distortion of the Thrie-Beam Connection and the MBSG Transition. Cut bolts off after installation so as to extend no more than 3/4" beyond nut. Paint ends of cut-off bolts with Zinc-rich paint.

5 ~ 1" Dia holes and 2 1/2" Dia x 2" deep recesses. Form or core holes and recesses. Percussion drilling is not permitted. Adjust placement of reinforcing steel as necessary to avoid bolt holes and recesses.



ELEVATION SHOWING TYPICAL REINFORCING PLACEMENT



SECTION
ELEVATION
TERMINAL CONNECTION DETAILS

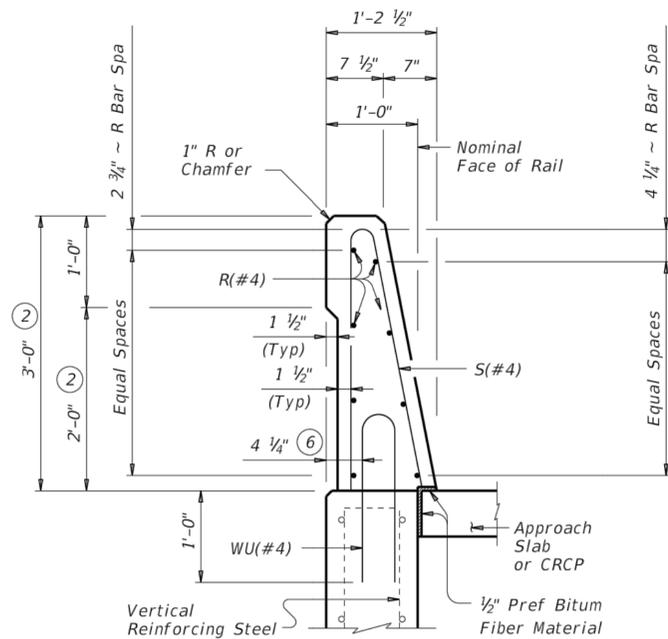
- 1 Terminal Connectors and associated hardware are to be paid for under the Item "Metal Beam Guard Fence". Attach Metal Beam Guard Fence Transitions to the bridge rail and extend along the embankment unless otherwise shown in the plans.
- 2 Increase 2" for structures with Overlay.
- 3 Back of rail offset may, with Engineer's approval, be continued to the end of the railing.
- 4 Place 4 additional Bars R(#4) 3'-8" in length inside Bars S(#4) and centered 2'-0" from end of rail when Terminal Connections are required.
- 5 Bolt recesses are only required when pedestrian sidewalks are adjacent to back of rail.

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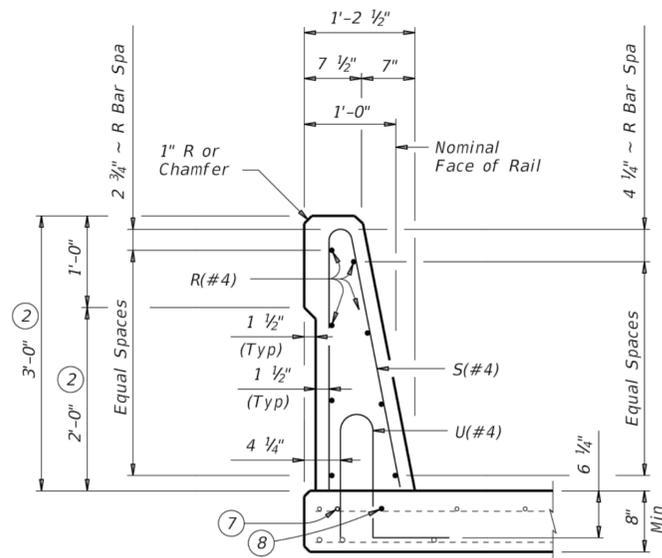
		Bridge Division Standard	
<h2>TRAFFIC RAIL SINGLE SLOPE</h2>			
<h3>TYPE SSTR</h3>			
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CON: TxDOT	SECT:	JOB:	HIGHWAY:
REVISIONS:			
DIST:	COUNTY:	SHEET NO.:	

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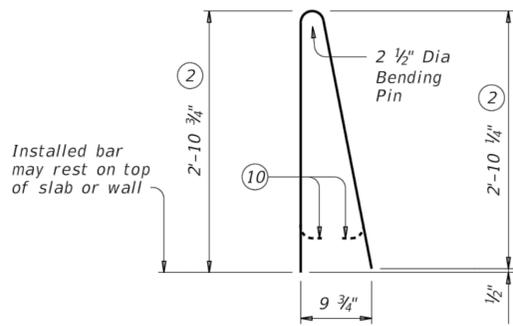


ON ABUTMENT WINGWALLS OR CIP RETAINING WALLS

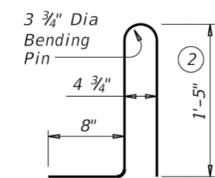


ON BRIDGE SLAB

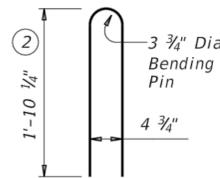
SECTIONS THRU RAIL



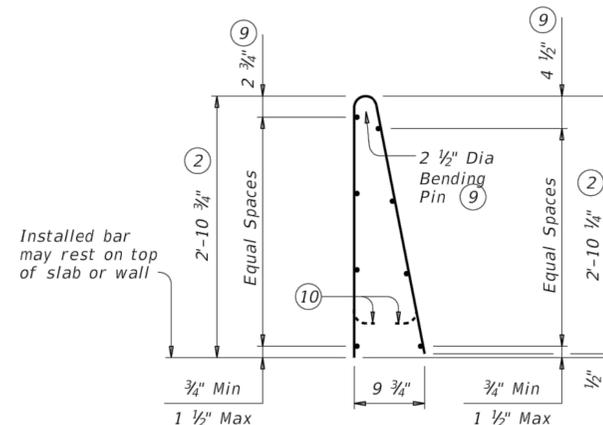
BARS S (#4)



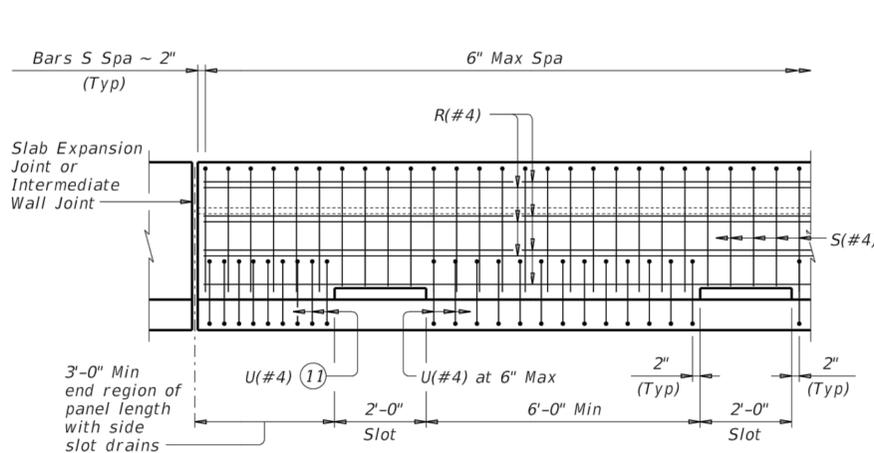
BARS U (#4)



BARS WU (#4)

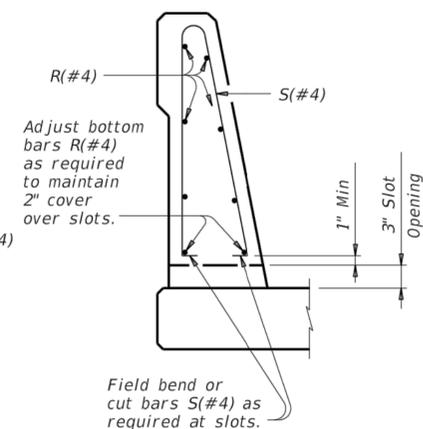


OPTIONAL WELDED WIRE REINFORCEMENT (WWR)



OPTIONAL SIDE SLOT DRAIN DETAIL

Note: Side Slot Drains may be used where shown elsewhere on the plans or as directed by the Engineer. Drains should not be placed over railroad tracks, lower roadways, or sidewalks. When this rail is used as a separator between a roadway surface and a sidewalk surface, side drain slots will not be permitted.



SECTION THRU OPTIONAL SIDE SLOT DRAIN

- ② Increase 2" for structures with Overlay.
- ⑥ 5 1/4" when vertical reinforcing has closer clear cover over horizontal reinforcing in abutment wingwalls or retaining walls on traffic side of wall.
- ⑦ As an aid in supporting reinforcement, additional longitudinal bars may be used in the slab with the approval of the Engineer. Such bars must be furnished at the Contractor's expense.
- ⑧ Top longitudinal slab bar may be adjusted laterally 3" plus or minus to tie reinforcing.
- ⑨ No longitudinal wires may be within upper bend.
- ⑩ Bend or cut as required to clear drain slots.
- ⑪ Space U(#4) bars at 4" Max when end region of panel length is less than 6'-0" to side slot drain. Space U(#4) bars at 6" Max when end region of panel length is 6'-0" and greater to side slot drain.

CONSTRUCTION NOTES:

This railing may be constructed with slip-forms when approved by the Engineer, with equipment approved by the Engineer. Provide sensor control for both line and grade. Tack welding to provide bracing for slip-form operations is acceptable. Welding can be performed at a minimum spacing of 3 ft between the cage and the anchorage. It is permissible to weld to U, WU and S bars at any location on the cage. If increased bracing is needed, provide additional anchorage devices and weld in the upper two thirds of the cage. The back of railing must be vertical unless otherwise shown in the plans or approved by the Engineer.

MATERIAL NOTES:

Galvanize all steel components except reinforcing unless otherwise shown in plans. Provide Class "C" concrete. Provide Class "C" (HPC) if required elsewhere. Provide Grade 60 reinforcing steel. Epoxy coat all rail reinforcement if slab bars are epoxy coated. Deformed Welded Wire Reinforcement (WWR) (ASTM A1064) of equal size and spacing may be substituted for Bars U and WU unless noted otherwise. Deformed WWR (ASTM A1064) may be substituted for Bars R and S, as shown. Combinations of reinforcing steel and WWR or configurations of WWR other than shown are permitted if conditions in the table are satisfied. Provide the same laps as required for reinforcing bars. Provide bar laps, where required, as follows:
Uncoated ~ #4 = 1'-5"
Epoxy coated ~ #4 = 2'-1"

GENERAL NOTES:

This rail has been successfully evaluated by full-scale crash test to meet MASH TL-4 criteria. This rail can be used for speeds of 50 mph and greater when a TL-3 rated guard fence transition is used. When a TL-2 rated guard fence transition is used, this rail can only be used for speeds of 45 mph and less. Do not use this railing on bridges with expansion joints providing more than 5" movement. Rail anchorage details shown on this standard may require modification for select structure types. See appropriate details elsewhere in plans for modifications. Shop drawings will not be required for the Average weight of railing with no overlay.

DESCRIPTION	LONGITUDINAL WIRES	VERTICAL WIRES
Minimum (Cumulative Total) Wire Area	1.067 Sq In.	0.267 Sq In. per Ft
Minimum	No. of Wires	Spacing
Maximum	8	4"
Maximum Wire Size Differential	10	8"
	The smaller wire must have an area of 40% or more of the larger wire.	

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Texas Department of Transportation Bridge Division Standard

TRAFFIC RAIL SINGLE SLOPE

TYPE SSTR

FILE: r1std014.dgn	DN: TxDOT	CK: TxDOT	DW: JTR	CK: TxDOT
©TxDOT July 2014 REVISIONS	CONF	SECT	JOB	HIGHWAY
	DIST	COUNTY	SHEET NO.	

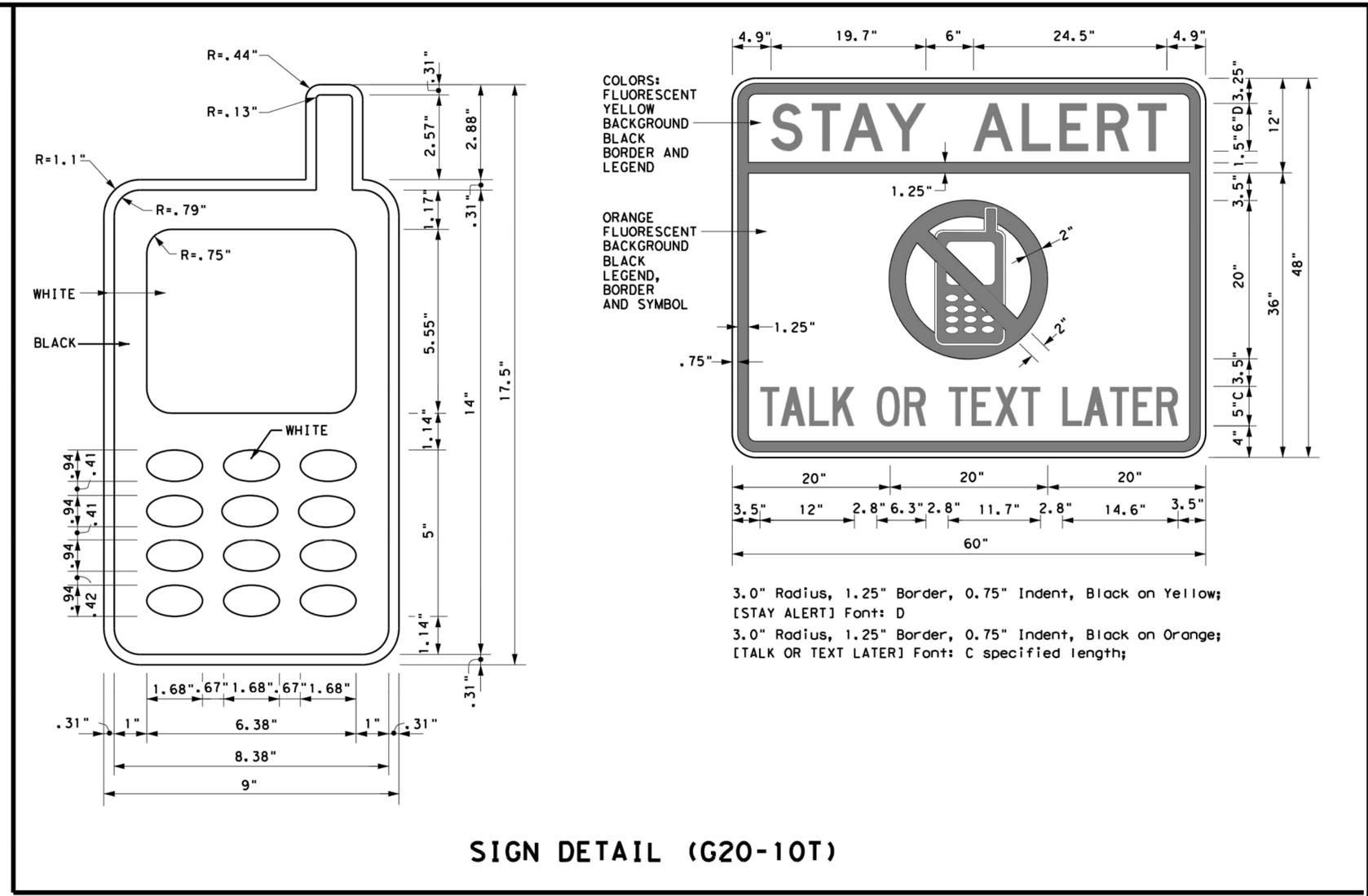
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BARRICADE AND CONSTRUCTION (BC) STANDARD SHEETS GENERAL NOTES:

- The Barricade and Construction Standard Sheets (BC sheets) are intended to show typical examples for placement of temporary traffic control devices, construction pavement markings, and typical work zone signs. The information contained in these sheets meet or exceed the requirements shown in the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- The development and design of the Traffic Control Plan (TCP) is the responsibility of the Engineer.
- The Contractor may propose changes to the TCP that are signed and sealed by a licensed professional engineer for approval. The Engineer may develop, sign and seal Contractor proposed changes.
- The Contractor is responsible for installing and maintaining the traffic control devices as shown in the plans. The Contractor may not move or change the approximate location of any device without the approval of the Engineer.
- Geometric design of lane shifts and detours should, when possible, meet the applicable design criteria contained in manuals such as the American Association of State Highway and Transportation Officials (AASHTO), "A Policy on Geometric Design of Highways and Streets," the TxDOT "Roadway Design Manual" or engineering judgment.
- When projects abut, the Engineer(s) may omit the END ROAD WORK, TRAFFIC FINES DOUBLE, and other advance warning signs if the signing would be redundant and the work areas appear continuous to the motorists. If the adjacent project is completed first, the Contractor shall erect the necessary warning signs as shown on these sheets, the TCP sheets or as directed by the Engineer. The BEGIN ROAD WORK NEXT X MILES sign shall be revised to show appropriate work zone distance.
- The Engineer may require duplicate warning signs on the median side of divided highways where median width will permit and traffic volumes justify the signing.
- All signs shall be constructed in accordance with the details found in the "Standard Highway Sign Designs for Texas," latest edition. Sign details not shown in this manual shall be shown in the plans or the Engineer shall provide a detail to the Contractor before the sign is manufactured.
- The temporary traffic control devices shown in the illustrations of the BC sheets are examples. As necessary, the Engineer will determine the most appropriate traffic control devices to be used.
- As shown on BC(2), the OBEY WARNING SIGNS STATE LAW sign, STAY ALERT TALK OR TEXT LATER (see Sign Detail G20-10T) and the WORK ZONE TRAFFIC FINES DOUBLE sign with plaque shall be erected in advance of the CSJ limits. However, the TRAFFIC FINES DOUBLE sign will not be required on projects consisting solely of mobile operation work, such as striping or milling edgeline rumble strips. The BEGIN ROAD WORK NEXT X MILES, CONTRACTOR and END ROAD WORK signs shall be erected at or near the CSJ limits.
- Except for devices required by Note 10, traffic control devices should be in place only while work is actually in progress or a definite need exists.
- The Engineer has the final decision on the location of all traffic control devices.
- Inactive equipment and work vehicles, including workers' private vehicles must be parked away from travel lanes. They should be as close to the right-of-way line as possible, or located behind a barrier or guardrail, or as approved by the Engineer.

WORKER SAFETY APPAREL NOTES:

- Workers on foot who are exposed to traffic or to construction equipment within the right-of-way shall wear high-visibility safety apparel meeting the requirements of ISEA "American National Standard for High-Visibility Apparel," or equivalent revisions, and labeled as ANSI 107-2004 standard performance for Class 2 or 3 risk exposure. Class 3 garments should be considered for high traffic volume work areas or night time work.



SIGN DETAIL (G20-10T)

Only pre-qualified products shall be used. The "Compliant Work Zone Traffic Control Devices List" (CWZTCD) describes pre-qualified products and their sources and may be found on-line at the web address given below or by contacting:

Texas Department of Transportation
 Traffic Operations Division - TE
 Phone (512) 416-3118

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THE DOCUMENTS BELOW CAN BE FOUND ON-LINE AT http://www.txdot.gov	
COMPLIANT WORK ZONE TRAFFIC CONTROL DEVICES LIST (CWZTCD)	
DEPARTMENTAL MATERIAL SPECIFICATIONS (DMS)	
MATERIAL PRODUCER LIST (MPL)	
ROADWAY DESIGN MANUAL - SEE "MANUALS (ONLINE MANUALS)"	
STANDARD HIGHWAY SIGN DESIGNS FOR TEXAS (SHSD)	
TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD)	
TRAFFIC ENGINEERING STANDARD SHEETS	

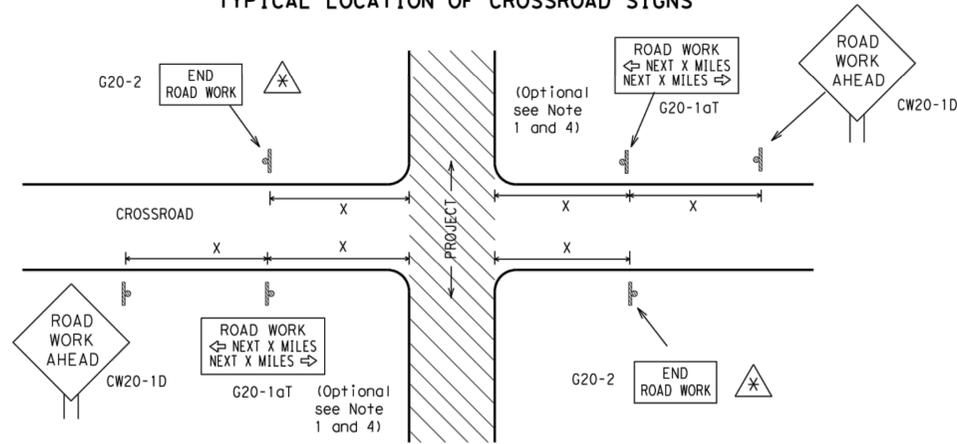
		<i>Traffic Operations Division Standard</i>	
BARRICADE AND CONSTRUCTION GENERAL NOTES AND REQUIREMENTS			
BC (1) - 14			
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT	SECT	JOB
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9-07	7-13		
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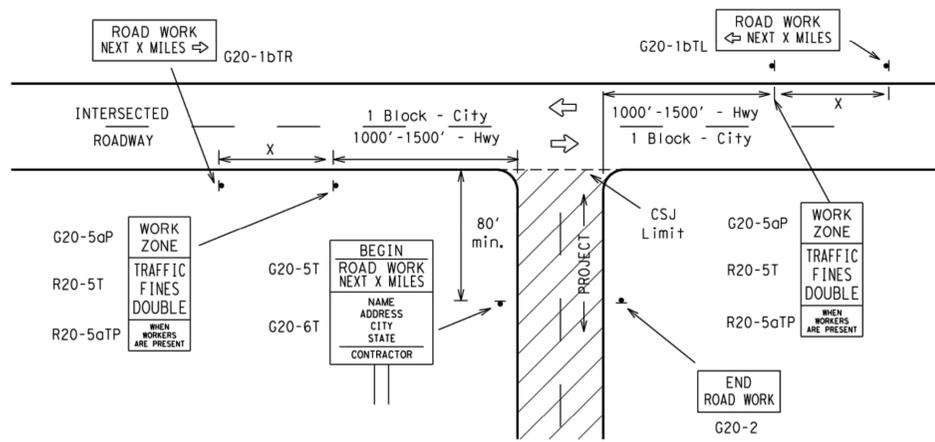
TYPICAL LOCATION OF CROSSROAD SIGNS



△ May be mounted on back of "ROAD WORK AHEAD" (CW20-1D) sign with approval of Engineer. (See note 2 below)

- The typical minimum signing on a crossroad approach should be a "ROAD WORK AHEAD" (CW20-1D) sign and a (G20-2) "END ROAD WORK" sign, unless noted otherwise in plans.
- The Engineer may use the reduced size 36" x 36" ROAD WORK AHEAD (CW20-1D) sign mounted back to back with the reduced size 36" x 18" "END ROAD WORK" (G20-2) sign on low volume crossroads (see Note 4 under "Typical Construction Warning Sign Size and Spacing"). See the "Standard Highway Sign Designs for Texas" manual for sign details. The Engineer may omit the advance warning signs on low volume crossroads. The Engineer will determine whether a road is low volume. This information shall be shown in the plans.
- Based on existing field conditions, the Engineer/Inspector may require additional signs such as FLAGGER AHEAD, LOOSE GRAVEL, or other appropriate signs. When additional signs are required, these signs will be considered part of the minimum requirements. The Engineer/Inspector will determine the proper location and spacing of any sign not shown on the BC sheets, Traffic Control Plan sheets or the Work Zone Standard Sheets.
- The "ROAD WORK NEXT X MILES" (G20-1aT) sign shall be required at high volume crossroads to advise motorists of the length of construction in either direction from the intersection. The Engineer will determine whether a roadway is considered high volume.
- Additional traffic control devices may be shown elsewhere in the plans for higher volume crossroads.
- When work occurs in the intersection area, appropriate traffic control devices, as shown elsewhere in the plans or as determined by the Engineer/Inspector, shall be in place.

T-INTERSECTION



CSJ LIMITS AT T-INTERSECTION

- The Engineer will determine the types and location of any additional traffic control devices, such as a flagger and accompanying signs, or other signs, that should be used when work is being performed at or near an intersection.
- If construction closes the road at a T-intersection the Contractor shall place the "CONTRACTOR NAME" (G20-6T) sign behind the Type 3 Barricades for the road closure (see BC(10) also). The "ROAD WORK NEXT X MILES" left arrow (G20-1bTL) and "ROAD WORK NEXT X MILES" right arrow (G20-1bTR) signs shall be replaced by the detour signing called for in the plans.

TYPICAL CONSTRUCTION WARNING SIGN SIZE AND SPACING^{1,5,6}

Sign Number or Series	SIZE		SPACING	
	Conventional Road	Expressway/Freeway	Posted Speed MPH	Sign Δ Spacing "X" Feet (Apprx.)
CW20 ⁴	48" x 48"	48" x 48"	30	120
CW21			35	160
CW22			40	240
CW23			45	320
CW25			50	400
CW1, CW2, CW7, CW8, CW9, CW11, CW14	36" x 36"	48" x 48"	55	500 ²
CW3, CW4, CW5, CW6, CW8-3, CW10, CW12	48" x 48"	48" x 48"	60	600 ²
			65	700 ²
			70	800 ²
			75	900 ²
			80	1000 ²
			*	* ³

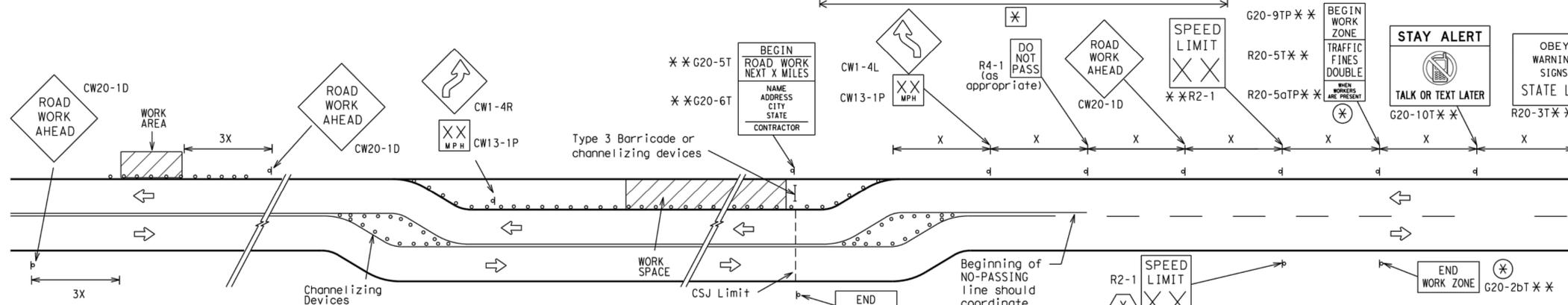
* For typical sign spacings on divided highways, expressways and freeways, see Part 6 of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) typical application diagrams or TCP Standard Sheets.

Δ Minimum distance from work area to first Advance Warning sign nearest the work area and/or distance between each additional sign.

GENERAL NOTES

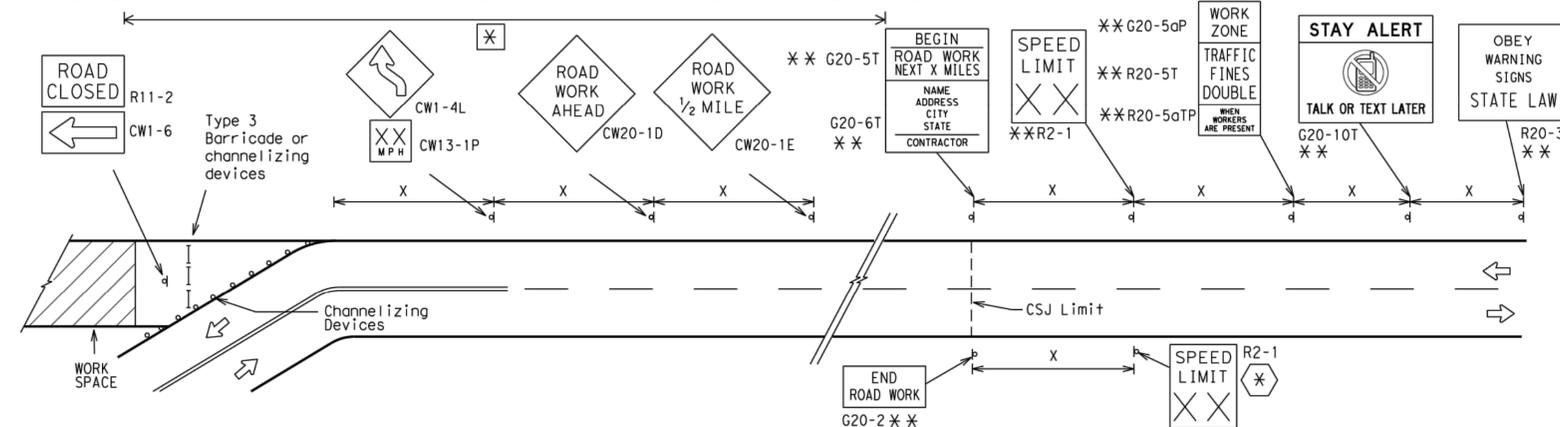
- Special or larger size signs may be used as necessary.
- Distance between signs should be increased as required to have 1500 feet advance warning.
- Distance between signs should be increased as required to have 1/2 mile or more advance warning.
- 36" x 36" "ROAD WORK AHEAD" (CW20-1D) signs may be used on low volume crossroads at the discretion of the Engineer. See Note 2 under "Typical Location of Crossroad Signs".
- Only diamond shaped warning sign sizes are indicated.
- See sign size listing in "TMUTCD", Sign Appendix or the "Standard Highway Sign Designs for Texas" manual for complete list of available sign design sizes.

WORK AREAS IN MULTIPLE LOCATIONS WITHIN CSJ LIMITS

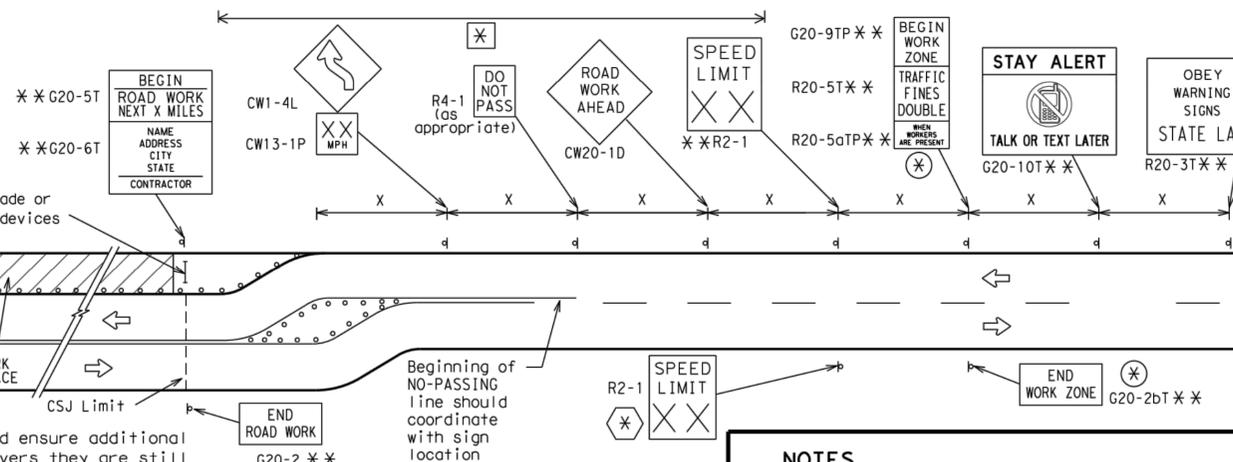


When extended distances occur between minimal work spaces, the Engineer/Inspector should ensure additional "ROAD WORK AHEAD" (CW20-1D) signs are placed in advance of these work areas to remind drivers they are still within the project limits. See the applicable TCP sheets for exact location and spacing of signs and channelizing devices.

SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING DOWNSTREAM OF THE CSJ LIMITS



SAMPLE LAYOUT OF SIGNING FOR WORK BEGINNING AT THE CSJ LIMITS



NOTES

The Contractor shall determine the appropriate distance to be placed on the G20-1 series signs and "BEGIN ROAD WORK NEXT X MILES" (G20-5T) sign for each specific project. This distance shall replace the "X" and shall be rounded to the nearest whole mile with the approval of the Engineer. No decimals shall be used.

⊗ The "BEGIN WORK ZONE" (G20-9TP) and "END WORK ZONE" (G20-2bT) shall be used as shown on the sample layout when advance signs are required outside the CSJ Limits. They inform the motorist of entering or leaving a part of the work zone lying outside the CSJ Limits where traffic fines may double if workers are present.

** Required CSJ Limit signing. See Note 10 on BC(1). TRAFFIC FINES DOUBLE signs will not be required on projects consisting solely of mobile operations work.

⊗ Area for placement of "ROAD WORK AHEAD" (CW20-1D) sign and other signs or devices as called for on the Traffic Control Plan.

⊗ Contractor will install a regulatory speed limit sign at the end of the work zone.

LEGEND

—	Type 3 Barricade
○ ○ ○	Channelizing Device
⊗	Sign
X	See Typical Construction Warning Sign Size Spacing chart or TMUTCD for sign spacing requirements

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SHEET 2 OF 12



BARRICADE AND CONSTRUCTION PROJECT LIMIT

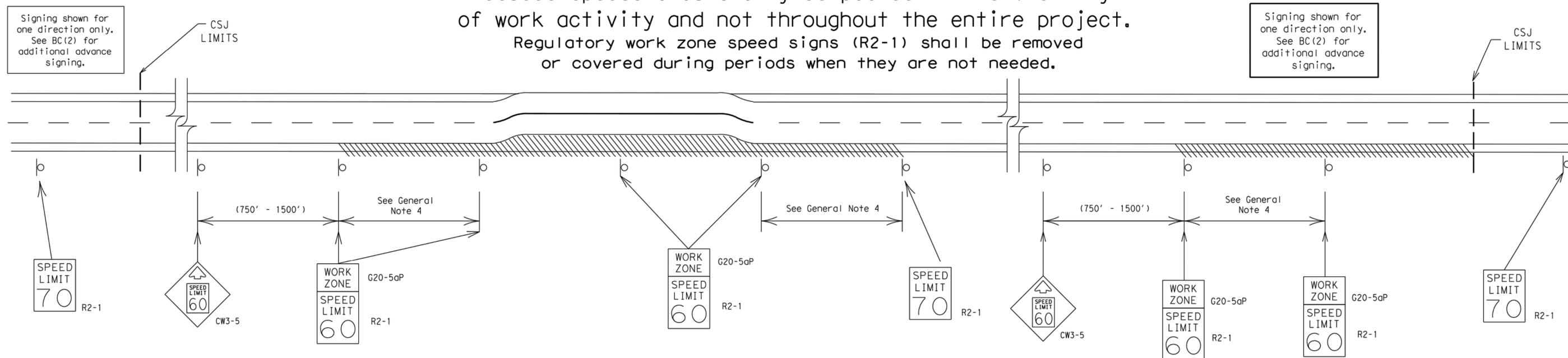
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TYPICAL APPLICATION OF WORK ZONE SPEED LIMIT SIGNS

Work zone speed limits shall be regulatory, established in accordance with the "Procedures for Establishing Speed Zones," and approved by the Texas Transportation Commission, or by City Ordinance when within Incorporated City Limits.

Reduced speeds should only be posted in the vicinity of work activity and not throughout the entire project. Regulatory work zone speed signs (R2-1) shall be removed or covered during periods when they are not needed.



GUIDANCE FOR USE:

LONG/INTERMEDIATE TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit should be included on the design of the traffic control plans when restricted geometrics with a lower design speed are present in the work zone and modification of the geometrics to a higher design speed is not feasible.

Long/Intermediate Term Work Zone Speed Limit signs, when approved as described above, should be posted and visible to the motorist when work activity is present. Work activity may also be defined as a change in the roadway that requires a reduced speed for motorists to safely negotiate the work area, including:

- rough road or damaged pavement surface
- substantial alteration of roadway geometrics (diversions)
- construction detours
- grade
- width
- other conditions readily apparent to the driver

As long as any of these conditions exist, the work zone speed limit signs should remain in place.

SHORT TERM WORK ZONE SPEED LIMITS

This type of work zone speed limit may be included on the design of the traffic control plans when workers or equipment are not behind concrete barrier, when work activity is within 10 feet of the traveled way or actually in the travelled way.

Short Term Work Zone Speed Limit signs should be posted and visible to the motorists only when work activity is present. When work activity is not present, signs shall be removed or covered. (See Removing or Covering on BC(4)).

GENERAL NOTES

- Regulatory work zone speed limits should be used only for sections of construction projects where speed control is of major importance.
- Regulatory work zone speed limit signs shall be placed on supports at a 7 foot minimum mounting height.
- Speed zone signs are illustrated for one direction of travel and are normally posted for each direction of travel.
- Frequency of work zone speed limit signs should be:

40 mph and greater	0.2 to 2 miles
35 mph and less	0.2 to 1 mile
- Regulatory speed limit signs shall have black legend and border on a white reflective background (See "Reflective Sheeting" on BC(4)).
- Fabrication, erection and maintenance of the "ADVANCE SPEED LIMIT" (CW3-5) sign, "WORK ZONE" (G20-5aP) plaque and the "SPEED LIMIT" (R2-1) signs shall not be paid for directly, but shall be considered subsidiary to Item 502.
- Turning signs from view, laying signs over or down will not be allowed, unless as otherwise noted under "REMOVING OR COVERING" on BC(4).
- Techniques that may help reduce traffic speeds include but are not limited to:
 - Law enforcement.
 - Flagger stationed next to sign.
 - Portable changeable message sign (PCMS).
 - Low-power (drone) radar transmitter.
 - Speed monitor trailers or signs.
- Speeds shown on details above are for illustration only. Work Zone Speed Limits should only be posted as approved for each project.
- For more specific guidance concerning the type of work, work zone conditions and factors impacting allowable regulatory construction speed zone reduction see TxDOT form #1204 in the TxDOT e-form system.

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SHEET 3 OF 12



BARRICADE AND CONSTRUCTION WORK ZONE SPEED LIMIT

BC (3) - 14

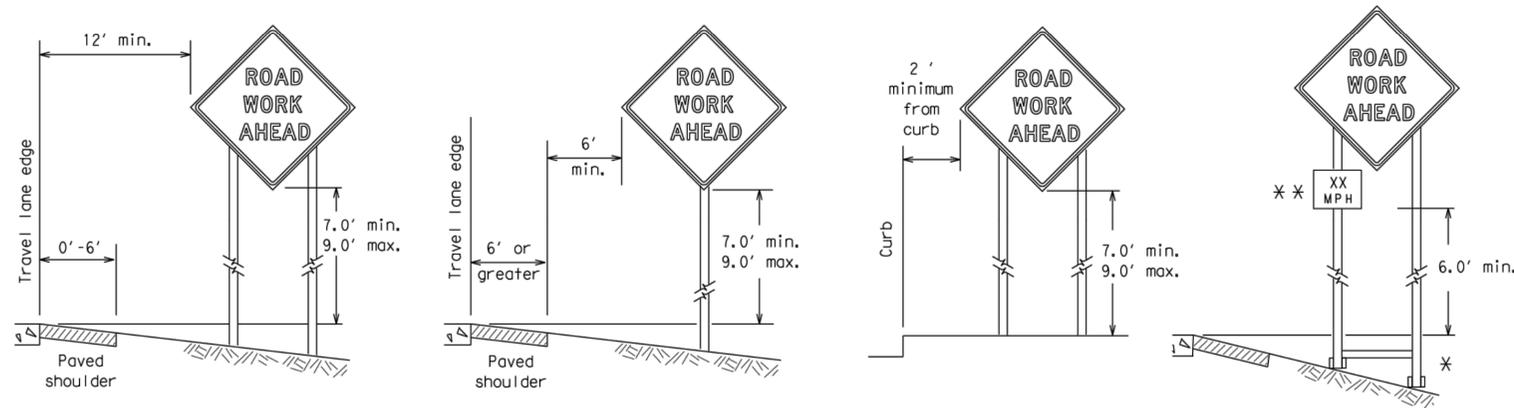
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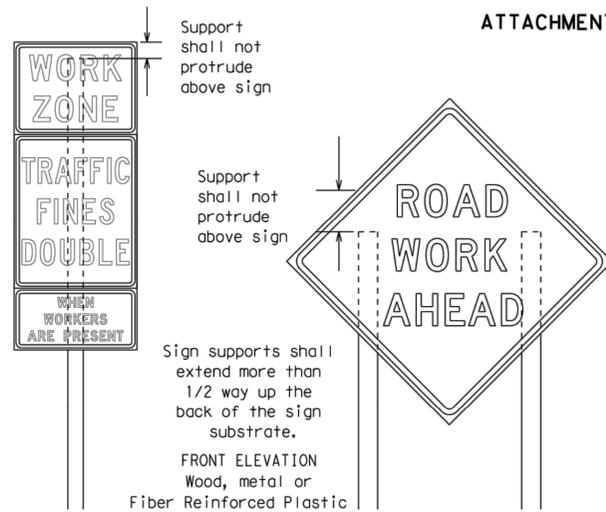
TYPICAL MINIMUM CLEARANCES FOR LONG TERM AND INTERMEDIATE TERM SIGNS



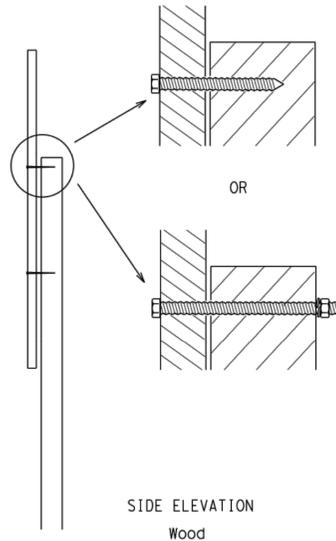
* When placing skid supports on unlevel ground, the leg post lengths must be adjusted so the sign appears straight and plumb. Objects shall NOT be placed under skids as a means of leveling.

** When plaques are placed on dual-leg supports, they should be attached to the upright nearest the travel lane. Supplemental plaques (advisory or distance) should not cover the surface of the parent sign.

ATTACHMENT FOR SIGN SUPPORTS



Attachment to wooden supports will be by bolts and nuts or screws. Use TxDOT's or manufacturer's recommended procedures for attaching sign substrates to other types of sign supports

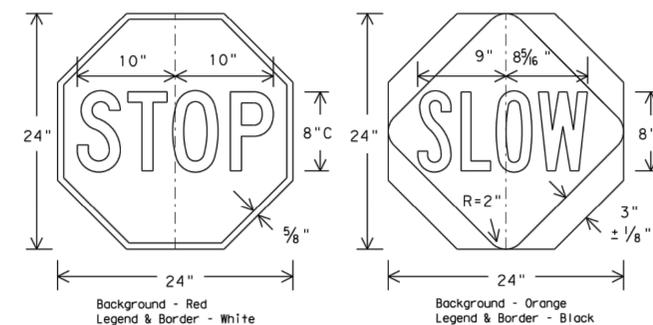


Nails shall NOT be allowed. Each sign shall be attached directly to the sign support. Multiple signs shall not be joined or spliced by any means. Wood supports shall not be extended or repaired by splicing or other means.

Splicing embedded perforated square metal tubing in order to extend post height will only be allowed when the splice is made using four bolts, two above and two below the splice point. Splice must be located entirely behind the sign substrate, not near the base of the support. Splice insert lengths should be at least 5 times nominal post size, centered on the splice and of at least the same gauge material.

STOP/SLOW PADDLES

- STOP/SLOW paddles are the primary method to control traffic by flaggers. The STOP/SLOW paddle size should be 24" x 24" as detailed below.
- When used at night, the STOP/SLOW paddle shall be retroreflectORIZED.
- STOP/SLOW paddles may be attached to a staff with a minimum length of 6' to the bottom of the sign.
- Any lights incorporated into the STOP or SLOW paddle faces shall only be as specifically described in Section 6E.03 Hand Signaling Devices in the TMUTCD.



CONTRACTOR REQUIREMENTS FOR MAINTAINING PERMANENT SIGNS WITHIN THE PROJECT LIMITS

- Permanent signs are used to give notice of traffic laws or regulations, call attention to conditions that are potentially hazardous to traffic operations, show route designations, destinations, directions, distances, services, points of interest, and other geographical, recreational, or cultural information. Drivers proceeding through a work zone need the same, if not better route guidance as normally installed on a roadway without construction.
- When permanent regulatory or warning signs conflict with work zone conditions, remove or cover the permanent signs until the permanent sign message matches the roadway condition.
- When existing permanent signs are moved and relocated due to construction purposes, they shall be visible to motorists at all times.
- If existing signs are to be relocated on their original supports, they shall be installed on crashworthy bases as shown on the SMD Standard sheets. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards. This work should be paid for under the appropriate pay item for relocating existing signs.
- If permanent signs are to be removed and relocated using temporary supports, the Contractor shall use crashworthy supports as shown on the BC sheets or the CWZTCD. The signs shall meet the required mounting heights shown on the BC Sheets or the SMD Standards during construction. This work should be paid for under the appropriate pay item for relocating existing signs.
- Any sign or traffic control device that is struck or damaged by the Contractor or his/her construction equipment shall be replaced as soon as possible by the Contractor to ensure proper guidance for the motorists. This will be subsidiary to Item 502.

GENERAL NOTES FOR WORK ZONE SIGNS

- Contractor shall install and maintain signs in a straight and plumb condition and/or as directed by the Engineer.
 - Wooden sign posts shall be painted white.
 - Barricades shall NOT be used as sign supports.
 - All signs shall be installed in accordance with the plans or as directed by the Engineer. Signs shall be used to regulate, warn, and guide the traveling public safely through the work zone.
 - The Contractor may furnish either the sign design shown in the plans or in the "Standard Highway Sign Designs for Texas" (SHSD). The Engineer/Inspector may require the Contractor to furnish other work zone signs that are shown in the TMUTCD but may have been omitted from the plans. Any variation in the plans shall be documented by written agreement between the Engineer and the Contractor's Responsible Person. All changes must be documented in writing before being implemented. This can include documenting the changes in the Inspector's TxDOT diary and having both the Inspector and Contractor initial and date the agreed upon changes.
 - The Contractor shall furnish sign supports listed in the "Compliant Work Zone Traffic Control Device List" (CWZTCD). The Contractor shall install the sign support in accordance with the manufacturer's recommendations. If there is a question regarding installation procedures, the Contractor shall furnish the Engineer a copy of the manufacturer's installation recommendations so the Engineer can verify the correct procedures are being followed.
 - The Contractor is responsible for installing signs on approved supports and replacing signs with damaged or cracked substrates and/or damaged or marred reflective sheeting as directed by the Engineer/Inspector.
 - Identification markings may be shown only on the back of the sign substrate. The maximum height of letters and/or company logos used for identification shall be 1 inch.
 - The Contractor shall replace damaged wood posts. New or damaged wood sign posts shall not be spliced.
- DURATION OF WORK (as defined by the "Texas Manual on Uniform Traffic Control Devices" Part 6)**
- The types of sign supports, sign mounting height, the size of signs, and the type of sign substrates can vary based on the type of work being performed. The Engineer is responsible for selecting the appropriate size sign for the type of work being performed. The Contractor is responsible for ensuring the sign support, sign mounting height and substrate meets manufacturer's recommendations in regard to crashworthiness and duration of work requirements.
 - Long-term stationary - work that occupies a location more than 3 days.
 - Intermediate-term stationary - work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than one hour.
 - Short-term stationary - daytime work that occupies a location for more than 1 hour in a single daylight period.
 - Short, duration - work that occupies a location up to 1 hour.
 - Mobile - work that moves continuously or intermittently (stopping for up to approximately 15 minutes.)

SIGN MOUNTING HEIGHT

- The bottom of Long-term/Intermediate-term signs shall be at least 7 feet, but not more than 9 feet, above the paved surface, except as shown for supplemental plaques mounted below other signs.
- The bottom of Short-term/Short Duration signs shall be a minimum of 1 foot above the pavement surface but no more than 2 feet above the ground.
- Long-term/Intermediate-term Signs may be used in lieu of Short-term/Short Duration signing.
- Short-term/Short Duration signs shall be used only during daylight and shall be removed at the end of the workday or raised to appropriate Long-term/Intermediate sign height.
- Regulatory signs shall be mounted at least 7 feet, but not more than 9 feet, above the paved surface regardless of work duration.

SIZE OF SIGNS

- The Contractor shall furnish the sign sizes shown on BC (2) unless otherwise shown in the plans or as directed by the Engineer.

SIGN SUBSTRATES

- The Contractor shall ensure the sign substrate is installed in accordance with the manufacturer's recommendations for the type of sign support that is being used. The CWZTCD lists each substrate that can be used on the different types and models of sign supports.
- "Mesh" type materials are NOT an approved sign substrate, regardless of the tightness of the weave.
- All wooden individual sign panels fabricated from 2 or more pieces shall have one or more plywood cleat, 1/2" thick by 6" wide, fastened to the back of the sign and extending fully across the sign. The cleat shall be attached to the back of the sign using wood screws that do not penetrate the face of the sign panel. The screws shall be placed on both sides of the splice and spaced at 6" centers. The Engineer may approve other methods of splicing the sign face.

REFLECTIVE SHEETING

- All signs shall be retroreflective and constructed of sheeting meeting the color and retro-reflectivity requirements of DMS-8300 for rigid signs or DMS-8310 for roll-up signs. The web address for DMS specifications is shown on BC(1).
- White sheeting, meeting the requirements of DMS-8300 Type A, shall be used for signs with a white background.
- Orange sheeting, meeting the requirements of DMS-8300 Type B_{FL} or Type C_{FL}, shall be used for rigid signs with orange backgrounds.

SIGN LETTERS

- All sign letters and numbers shall be clear, and open rounded type uppercase alphabet letters as approved by the Federal Highway Administration (FHWA) and as published in the "Standard Highway Sign Design for Texas" manual. Signs, letters and numbers shall be of first class workmanship in accordance with Department Standards and Specifications.

REMOVING OR COVERING

- When sign messages may be confusing or do not apply, the signs shall be removed or completely covered.
- Long-term stationary or intermediate stationary signs installed on square metal tubing may be turned away from traffic 90 degrees when the sign message is not applicable. This technique may not be used for signs installed in the median of divided highways or near any intersections where the sign may be seen from approaching traffic.
- Signs installed on wooden skids shall not be turned at 90 degree angles to the roadway. These signs should be removed or covered when not required.
- When signs are covered, the material used shall be opaque, such as heavy mil black plastic, or other materials which will entirely sign face and maintain their opaque properties under automobile headlights at night, without damaging the sign sheet.
- Burlap shall NOT be used to cover signs.
- Duct tape or other adhesive material shall NOT be affixed to a sign face.
- Signs and anchor stubs shall be removed and holes backfilled upon completion of work.

SIGN SUPPORT WEIGHTS

- Where sign supports require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand should be used.
- The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight.
- Rock, concrete, iron, steel or other solid objects shall not be permitted for use as sign support weights.
- Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs.
- Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall NOT be used.
- Rubber ballasts designed for channelizing devices should not be used for ballast on portable sign supports. Sign supports designed and manufactured with rubber bases may be used when shown on the CWZTCD list.
- Sandbags shall only be placed along or laid over the base supports of the traffic control device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners. Sandbags shall be placed along the length of the skids to weigh down the sign support.
- Sandbags shall NOT be placed under the skid and shall not be used to level sign supports placed on slopes.

FLAGS ON SIGNS

- Flags may be used to draw attention to warning signs. When used the flag shall be 16 inches square or larger and shall be orange or fluorescent red-orange in color. Flags shall not be allowed to cover any portion of the sign face.

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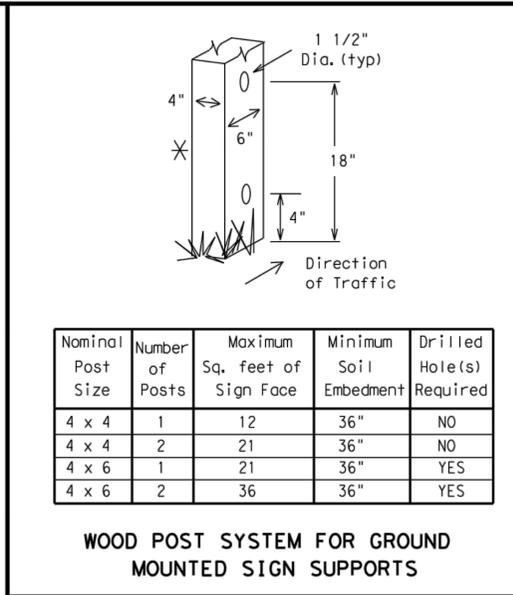
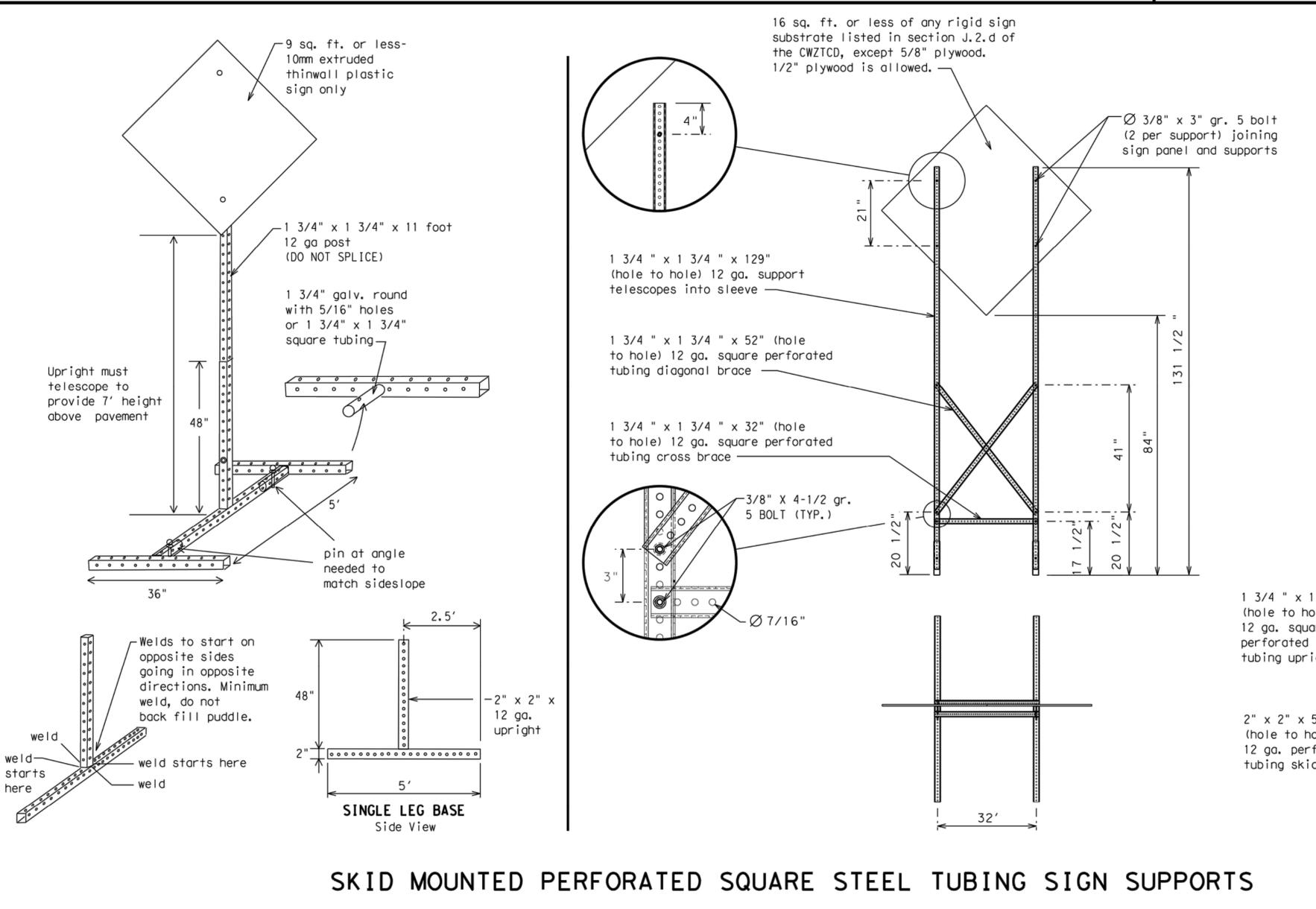
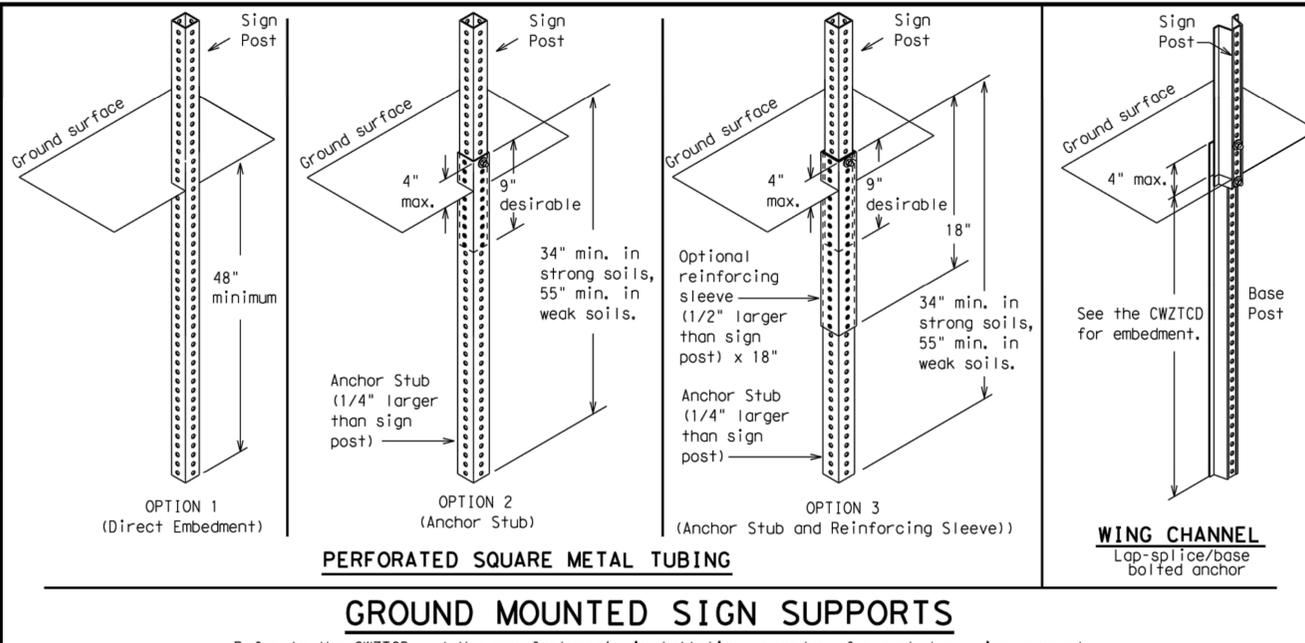
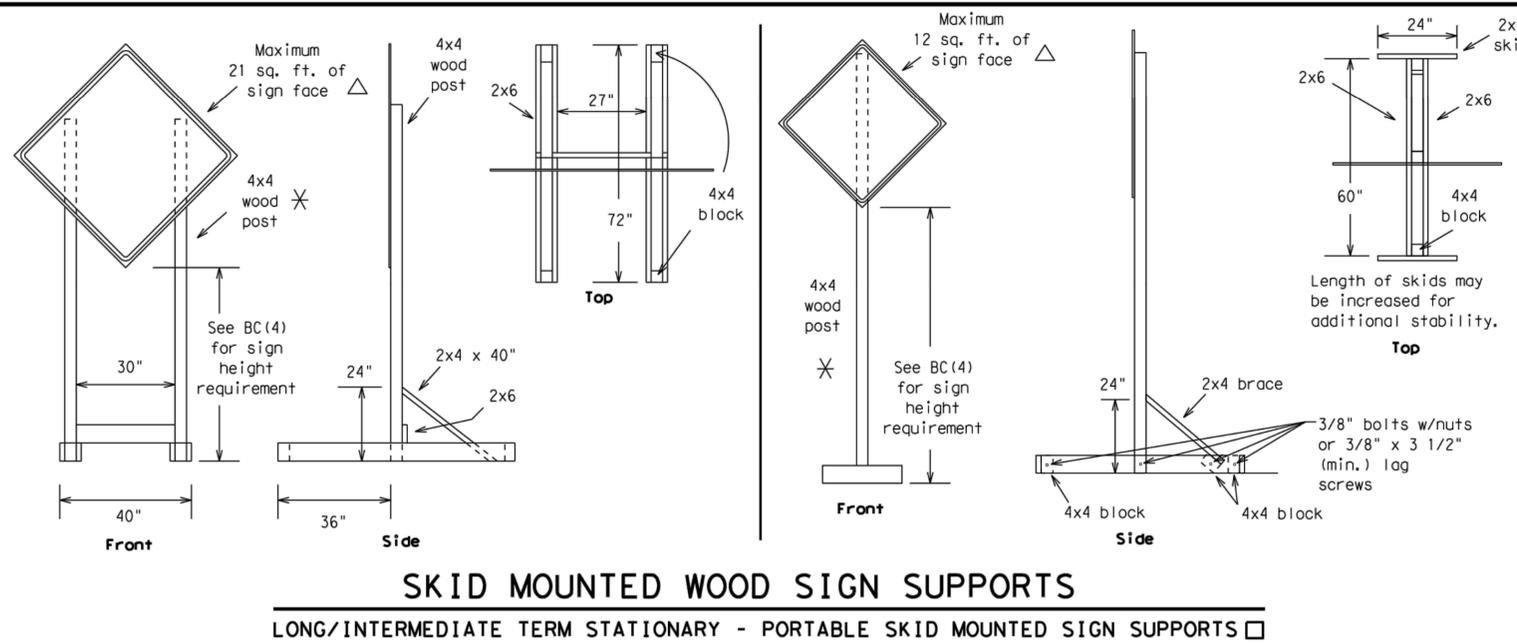
SHEET 4 OF 12

		Traffic Operations Division Standard	
<h2>BARRICADE AND CONSTRUCTION TEMPORARY SIGN NOTES</h2>			
<h3>BC (4) - 14</h3>			
FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT
© TxDOT November 2002	CONT	SECT	JOB
REVISIONS			HIGHWAY
9-07 8-14			
7-13			
	DIST	COUNTY	SHEET NO.

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WEDGE ANCHORS
Both steel and plastic Wedge Anchor Systems as shown on the SMD Standard Sheets may be used as temporary sign supports for signs up to 10 square feet of sign face. They may be set in concrete or in sturdy soils if approved by the Engineer. (See web address for "Traffic Engineering Standard Sheets" on BC(1)).

OTHER DESIGNS
MORE DETAILS OF APPROVED LONG/INTERMEDIATE AND SHORT TERM SUPPORTS CAN BE FOUND ON THE CWZTCD LIST. SEE BC(1) FOR WEBSITE LOCATION.

- GENERAL NOTES**
- Nails may be used in the assembly of wooden sign supports, but 3/8" bolts with nuts or 3/8" x 3 1/2" lag screws must be used on every joint for final connection.
 - No more than 2 sign posts shall be placed within a 7 ft. circle, except for specific materials noted on the CWZTCD List.
 - When project is completed, all sign supports and foundations shall be removed from the project site. This will be considered subsidiary to Item 502.

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SHEET 5 OF 12
Texas Department of Transportation
Traffic Operations Division Standard

BARRICADE AND CONSTRUCTION TYPICAL SIGN SUPPORT

BC (5) - 14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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9-07 8-14				
7-13	DIST	COUNTY	SHEET NO.	

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WHEN NOT IN USE, REMOVE THE PCMS FROM THE RIGHT-OF-WAY OR PLACE THE PCMS BEHIND BARRIER OR GUARDRAIL WITH SIGN PANEL TURNED PARALLEL TO TRAFFIC

RECOMMENDED PHASES AND FORMATS FOR PCMS MESSAGES DURING ROADWORK ACTIVITIES

(The Engineer may approve other messages not specifically covered here.)

PORTABLE CHANGEABLE MESSAGE SIGNS

- The Engineer/Inspector shall approve all messages used on portable changeable message signs (PCMS).
- Messages on PCMS should contain no more than 8 words (about four to eight characters per word), not including simple words such as "TO," "FOR," "AT," etc.
- Messages should consist of a single phase, or two phases that alternate. Three-phase messages are not allowed. Each phase of the message should convey a single thought, and must be understood by itself.
- Use the word "EXIT" to refer to an exit ramp on a freeway; i.e., "EXIT CLOSED." Do not use the term "RAMP."
- Always use the route or interstate designation (IH, US, SH, FM) along with the number when referring to a roadway.
- When in use the bottom of a stationary PCMS message panel should be a minimum 7 feet above the roadway, where possible.
- The message term "WEEKEND" should be used only if the work is to start on Saturday morning and end by Sunday evening at midnight. Actual days and hours of work should be displayed on the PCMS if work is to begin on Friday evening and/or continue into Monday morning.
- The Engineer/Inspector may select one of two options which are available for displaying a two-phase message on a PCMS. Each phase may be displayed for either four seconds each or for three seconds each.
- Do not "flash" messages or words included in a message. The message should be steady burn or continuous while displayed.
- Do not present redundant information on a two-phase message; i.e., keeping two lines of the message the same and changing the third line.
- Do not use the word "Danger" in message.
- Do not display the message "LANES SHIFT LEFT" or "LANES SHIFT RIGHT" on a PCMS. Drivers do not understand the message.
- Do not display messages that scroll horizontally or vertically across the face of the sign.
- The following table lists abbreviated words and two-word phrases that are acceptable for use on a PCMS. Both words in a phrase must be displayed together. Words or phrases not on this list should not be abbreviated, unless shown in the TMUTCD.
- PCMS character height should be at least 18 inches for trailer mounted units. They should be visible from at least 1/2 (.5) mile and the text should be legible from at least 600 feet at night and 800 feet in daylight. Truck mounted units must have a character height of 10 inches and must be legible from at least 400 feet.
- Each line of text should be centered on the message board rather than left or right justified.
- If disabled, the PCMS should default to an illegible display that will not alarm motorists and will only be used to alert workers that the PCMS has malfunctioned. A pattern such as a series of horizontal solid bars is appropriate.

Phase 1: Condition Lists

Road/Lane/Ramp Closure List

FREEWAY CLOSED X MILE
ROAD CLOSED AT SH XXX
ROAD CLSD AT FM XXXX
RIGHT X LANES CLOSED
CENTER LANE CLOSED
NIGHT LANE CLOSURES
VARIOUS LANES CLOSED
EXIT CLOSED
MALL DRIVEWAY CLOSED
XXXXXXXX BLVD CLOSED

Other Condition List

FRONTAGE ROAD CLOSED
SHOULDER CLOSED XXX FT
RIGHT LN CLOSED XXX FT
RIGHT X LANES OPEN
DAYTIME LANE CLOSURES
I-XX SOUTH EXIT CLOSED
EXIT XXX CLOSED X MILE
RIGHT LN TO BE CLOSED
X LANES CLOSED TUE - FRI

ROADWORK XXX FT
FLAGGER XXXX FT
RIGHT LN NARROWS XXXX FT
MERGING TRAFFIC XXXX FT
LOOSE GRAVEL XXXX FT
DETOUR X MILE
ROADWORK PAST SH XXXX
BUMP XXXX FT
TRAFFIC SIGNAL XXXX FT

ROAD REPAIRS XXXX FT
LANE NARROWS XXXX FT
TWO-WAY TRAFFIC XX MILE
CONST TRAFFIC XXX FT
UNEVEN LANES XXXX FT
ROUGH ROAD XXXX FT
ROADWORK NEXT FRI-SUN
US XXX EXIT X MILES
LANES SHIFT *

* LANES SHIFT in Phase 1 must be used with STAY IN LANE in Phase 2.

Phase 2: Possible Component Lists

Action to Take/Effect on Travel List

MERGE RIGHT
DETOUR NEXT X EXITS
USE EXIT XXX
STAY ON US XXX SOUTH
TRUCKS USE US XXX N
WATCH FOR TRUCKS
EXPECT DELAYS
REDUCE SPEED XXX FT
USE OTHER ROUTES
STAY IN LANE *

FORM X LINES RIGHT
USE XXXXX RD EXIT
USE EXIT I-XX NORTH
USE I-XX E TO I-XX N
WATCH FOR TRUCKS
EXPECT DELAYS
PREPARE TO STOP
END SHOULDER USE
WATCH FOR WORKERS

Location List

AT FM XXXX
BEFORE RAILROAD CROSSING
NEXT X MILES
PAST US XXX EXIT
XXXXXXXX TO XXXXXXX
US XXX TO FM XXXX

Warning List

SPEED LIMIT XX MPH
MAXIMUM SPEED XX MPH
MINIMUM SPEED XX MPH
ADVISORY SPEED XX MPH
RIGHT LANE EXIT
USE CAUTION
DRIVE SAFELY
DRIVE WITH CARE

** Advance Notice List

TUE-FRI XX AM - X PM
APR XX - XX X PM - X AM
BEGINS MONDAY
BEGINS MAY XX
MAY X - X XX PM - XX AM
NEXT FRI-SUN
XX AM TO XX PM
NEXT TUE AUG XX
TONIGHT XX PM - XX AM

** See Application Guidelines Note 6.

APPLICATION GUIDELINES

- Only 1 or 2 phases are to be used on a PCMS.
- The 1st phase (or both) should be selected from the "Road/Lane/Ramp Closure List" and the "Other Condition List".
- A 2nd phase can be selected from the "Action to Take/Effect on Travel, Location, General Warning, or Advance Notice Phase Lists".
- A Location Phase is necessary only if a distance or location is not included in the first phase selected.
- If two PCMS are used in sequence, they must be separated by a minimum of 1000 ft. Each PCMS shall be limited to two phases, and should be understandable by themselves.
- For advance notice, when the current date is within seven days of the actual work date, calendar days should be replaced with days of the week. Advance notification should typically be for no more than one week prior to the work.

WORDING ALTERNATIVES

- The words RIGHT, LEFT and ALL can be interchanged as appropriate.
- Roadway designations IH, US, SH, FM and LP can be interchanged as appropriate.
- EAST, WEST, NORTH and SOUTH (or abbreviations E, W, N and S) can be interchanged as appropriate.
- Highway names and numbers replaced as appropriate.
- ROAD, HIGHWAY and FREEWAY can be interchanged as needed.
- AHEAD may be used instead of distances if necessary.
- FT and MI, MILE and MILES interchanged as appropriate.
- AT, BEFORE and PAST interchanged as needed.
- Distances or AHEAD can be eliminated from the message if a location phase is used.

PCMS SIGNS WITHIN THE R.O.W. SHALL BE BEHIND GUARDRAIL OR CONCRETE BARRIER OR SHALL HAVE A MINIMUM OF FOUR (4) PLASTIC DRUMS PLACED PERPENDICULAR TO TRAFFIC ON THE UPSTREAM SIDE OF THE PCMS, WHEN EXPOSED TO ONE DIRECTION OF TRAFFIC. WHEN EXPOSED TO TWO WAY TRAFFIC, THE FOUR DRUMS SHOULD BE PLACED WITH ONE DRUM AT EACH OF THE FOUR CORNERS OF THE UNIT.

FULL MATRIX PCMS SIGNS

- When Full Matrix PCMS signs are used, the character height and legibility/visibility requirements shall be maintained as listed in Note 15 under "PORTABLE CHANGEABLE MESSAGE SIGNS" above.
- When symbol signs, such as the "Flagger Symbol" (CW20-7) are represented graphically on the Full Matrix PCMS sign and, with the approval of the Engineer, it shall maintain the legibility/visibility requirement listed above.
- When symbol signs are represented graphically on the Full Matrix PCMS, they shall only supplement the use of the static sign represented, and shall not substitute for, or replace that sign.
- A full matrix PCMS may be used to simulate a flashing arrow board provided it meets the visibility, flash rate and dimming requirements on BC(7), for the same size arrow.

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WORD OR PHRASE	ABBREVIATION	WORD OR PHRASE	ABBREVIATION
Access Road	ACCS RD	Major	MAJ
Alternate	ALT	Miles	MI
Avenue	AVE	Miles Per Hour	MPH
Best Route	BEST RTE	Minor	MNR
Boulevard	BLVD	Monday	MON
Bridge	BRDG	Normal	NORM
Canot	CANT	North	N
Center	CTR	Northbound (route) N	
Construction Ahead	CONST AHD	Parking	PKING
CROSSING	XING	Road	RD
Detour Route	DETOUR RTE	Right Lane	RT LN
Do Not	DONT	Saturday	SAT
East	E	Service Road	SERV RD
Eastbound (route) E		Shoulder	SHLDR
Emergency	EMER	Slipper	SLIP
Emergency Vehicle	EMER VEH	South	S
Entrance, Enter	ENT	Southbound (route) S	
Express Lane	EXP LN	Speed	SPD
Expressway	EXPWY	Street	ST
XXXX Feet	XXXX FT	Sunday	SUN
Fog Ahead	FOG AHD	Telephone	PHONE
Freeway	FRWY, FWY	Temporary	TEMP
Freeway Blocked	FWY BLKD	Thursday	THURS
Friday	FRI	To Downtown	TO DWNTN
Hazardous Driving	HAZ DRIVING	Traffic	TRAF
Hazardous Material	HAZMAT	Travelers	TRVLR
High-Occupancy Vehicle	HOV	Tuesday	TUES
Highway	HWY	Time Minutes	TIME MIN
Hour(s)	HR, HRS	Upper Level	UPR LEVEL
Information	INFO	Vehicles (s)	VEH, VEHS
It Is	ITS	Warning	WARN
Junction	JCT	Wednesday	WED
Left	LFT	Weight Limit	WT LIMIT
Left Lane	LFT LN	West	W
Lane Closed	LN CLOSED	Westbound (route) W	
Lower Level	LWR LEVEL	Wet Pavement	WET PVMT
Maintenance	MAINT	Will Not	WONT

Roadway designation # IH-number, US-number, SH-number, FM-number

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SHEET 6 OF 12



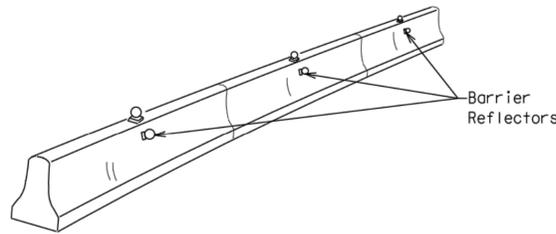
BARRICADE AND CONSTRUCTION PORTABLE CHANGEABLE MESSAGE SIGN (PCMS)

BC (6) - 14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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9-07 8-14	DIST	COUNTY	SHEET NO.	
7-13				

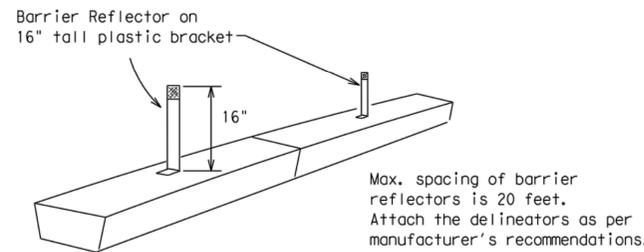
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- Barrier Reflectors shall be pre-qualified, and conform to the color and reflectivity requirements of DMS-8600. A list of prequalified Barrier Reflectors can be found at the Material Producer List web address shown on BC(1).
- Color of Barrier Reflectors shall be as specified in the TMUTCD. The cost of the reflectors shall be considered subsidiary to Item 512.

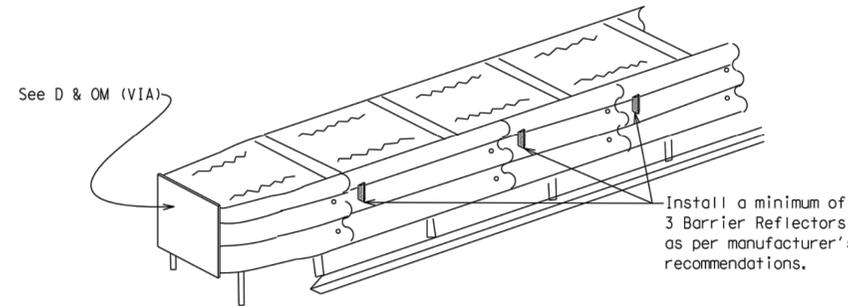


CONCRETE TRAFFIC BARRIER (CTB)

- Where traffic is on one side of the CTB, two (2) Barrier Reflectors shall be mounted in approximately the midsection of each section of CTB. An alternate mounting location is uniformly spaced at one end of each CTB. This will allow for attachment of a barrier grapple without damaging the reflector. The Barrier Reflector mounted on the side of the CTB shall be located directly below the reflector mounted on top of the barrier, as shown in the detail above.
- Where CTB separates two-way traffic, three barrier reflectors shall be mounted on each section of CTB. The reflector unit on top shall have two yellow reflective faces (Bi-Directional) while the reflectors on each side of the barrier shall have one yellow reflective face, as shown in the detail above.
- When CTB separates traffic traveling in the same direction, no barrier reflectors will be required on top of the CTB.
- Barrier Reflector units shall be yellow or white in color to match the edgeline being supplemented.
- Maximum spacing of Barrier Reflectors is forty (40) feet.
- Pavement markers or temporary flexible-reflective roadway marker tabs shall NOT be used as CTB delineation.
- Attachment of Barrier Reflectors to CTB shall be per manufacturer's recommendations.
- Missing or damaged Barrier Reflectors shall be replaced as directed by the Engineer.
- Single slope barriers shall be delineated as shown on the above detail.



LOW PROFILE CONCRETE BARRIER (LPCB)



DELINEATION OF END TREATMENTS

END TREATMENTS FOR CTB'S USED IN WORK ZONES

End treatments used on CTB's in work zones shall meet crashworthy standards as defined in the National Cooperative Highway Research Report 350. Refer to the CWZTCD List for approved end treatments and manufacturers.

BARRIER REFLECTORS FOR CONCRETE TRAFFIC BARRIER AND ATTENUATORS

WARNING LIGHTS

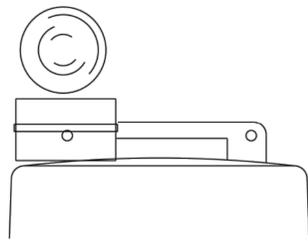
- Warning lights shall meet the requirements of the TMUTCD.
- Warning lights shall NOT be installed on barricades.
- Type A-Low Intensity Flashing Warning Lights are commonly used with drums. They are intended to warn of or mark a potentially hazardous area. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "FL". The Type A Warning Lights shall not be used with signs manufactured with Type B_{FL} or C_{FL} Sheeting meeting the requirements of Departmental Material Specification DMS-8300.
- Type-C and Type D 360 degree Steady Burn Lights are intended to be used in a series for delineation to supplement other traffic control devices. Their use shall be as indicated on this sheet and/or other sheets of the plans by the designation "SB".
- The Engineer/Inspector or the plans shall specify the location and type of warning lights to be installed on the traffic control devices.
- When required by the Engineer, the Contractor shall furnish a copy of the warning lights certification. The warning light manufacturer will certify the warning lights meet the requirements of the latest ITE Purchase Specifications for Flashing and Steady-Burn Warning Lights.
- When used to delineate curves, Type-C and Type D Steady Burn Lights should only be placed on the outside of the curve, not the inside.
- The location of warning lights and warning reflectors on drums shall be as shown elsewhere in the plans.

WARNING LIGHTS MOUNTED ON PLASTIC DRUMS

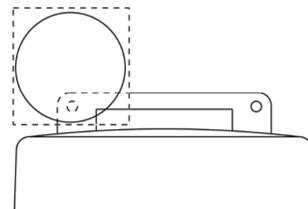
- Type A flashing warning lights are intended to warn drivers that they are approaching or are in a potentially hazardous area.
- Type A random flashing warning lights are not intended for delineation and shall not be used in a series.
- A series of sequential flashing warning lights placed on channelizing devices to form a merging taper may be used for delineation. If used, the successive flashing of the sequential warning lights should occur from the beginning of the taper to the end of the merging taper in order to identify the desired vehicle path. The rate of flashing for each light shall be 65 flashes per minute, plus or minus 10 flashes.
- Type C and D steady-burn warning lights are intended to be used in a series to delineate the edge of the travel lane on detours, on lane changes, on lane closures, and on other similar conditions.
- Type A, Type C and Type D warning lights shall be installed at locations as detailed on other sheets in the plans.
- Warning lights shall not be installed on a drum that has a sign, chevron or vertical panel.
- The maximum spacing for warning lights on drums should be identical to the channelizing device spacing.

WARNING REFLECTORS MOUNTED ON PLASTIC DRUMS AS A SUBSTITUTE FOR TYPE C (STEADY BURN) WARNING LIGHTS

- A warning reflector or approved substitute may be mounted on a plastic drum as a substitute for a Type C, steady burn warning light at the discretion of the Contractor unless otherwise noted in the plans.
- The warning reflector shall be yellow in color and shall be manufactured using a sign substrate approved for use with plastic drums listed on the CWZTCD.
- The warning reflector shall have a minimum retroreflective surface area (one-side) of 30 square inches.
- Round reflectors shall be fully reflectorized, including the area where attached to the drum.
- Square substrates must have a minimum of 30 square inches of reflectorized sheeting. They do not have to be reflectorized where it attaches to the drum.
- The side of the warning reflector facing approaching traffic shall have sheeting meeting the color and retroreflectivity requirements for DMS 8300-Type B or Type C.
- When used near two-way traffic, both sides of the warning reflector shall be reflectorized.
- The warning reflector should be mounted on the side of the handle nearest approaching traffic.
- The maximum spacing for warning reflectors should be identical to the channelizing device spacing requirements.



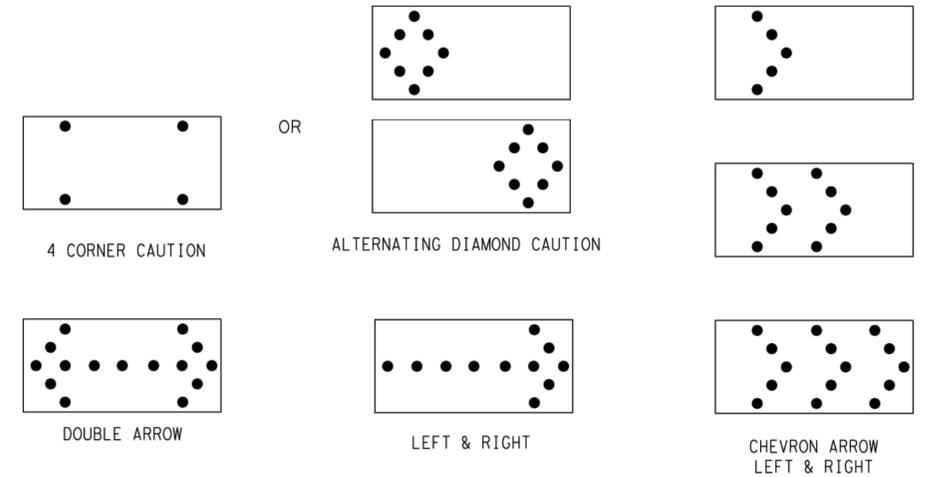
Type C Warning Light or approved substitute mounted on a drum adjacent to the travel way.



Warning reflector may be round or square. Must have a yellow reflective surface area of at least 30 square inches

Arrow Boards may be located behind channelizing devices in place for a shoulder taper or merging taper, otherwise they shall be delineated with four (4) channelizing devices placed perpendicular to traffic on the upstream side of traffic.

- The Flashing Arrow Board should be used for all lane closures on multi-lane roadways, or slow moving maintenance or construction activities on the travel lanes.
- Flashing Arrow Boards should not be used on two-lane, two-way roadways, detours, diversions or work on shoulders unless the "CAUTION" display (see detail below) is used.
- The Engineer/Inspector shall choose all appropriate signs, barricades and/or other traffic control devices that should be used in conjunction with the Flashing Arrow Board.
- The Flashing Arrow Board should be able to display the following symbols:



- The "CAUTION" display consists of four corner lamps flashing simultaneously, or the Alternating Diamond Caution mode as shown.
- The straight line caution display is NOT ALLOWED.
- The Flashing Arrow Board shall be capable of minimum 50 percent dimming from rated lamp voltage. The flashing rate of the lamps shall not be less than 25 nor more than 40 flashes per minute.
- Minimum lamp "on time" shall be approximately 50 percent for the flashing arrow and equal intervals of 25 percent for each sequential phase of the flashing chevron.
- The sequential arrow display is NOT ALLOWED.
- The flashing arrow display is the TxDOT standard; however, the sequential Chevron display may be used during daylight operations.
- The Flashing Arrow Board shall be mounted on a vehicle, trailer or other suitable support.
- A Flashing Arrow Board SHALL NOT BE USED to laterally shift traffic.
- A full matrix PCMS may be used to simulate a Flashing Arrow Board provided it meets visibility, flash rate and dimming requirements on this sheet for the same size arrow.
- Minimum mounting height of trailer mounted Arrow Boards should be 7 feet from roadway to bottom of panel.

REQUIREMENTS			
TYPE	MINIMUM SIZE	MINIMUM NUMBER OF PANEL LAMPS	MINIMUM VISIBILITY DISTANCE
B	30 x 60	13	3/4 mile
C	48 x 96	15	1 mile

ATTENTION
Flashing Arrow Boards shall be equipped with automatic dimming devices.

WHEN NOT IN USE, REMOVE FROM THE RIGHT-OF-WAY OR BEHIND TRAFFIC BARRIER OR

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FLASHING ARROW BOARDS

SHEET 7 OF 12

TRUCK-MOUNTED ATTENUATORS

- Truck-mounted attenuators (TMA) used on TxDOT facilities must meet the requirements outlined in the National Cooperative Highway Research Report No. 350 (NCHRP 350) or the Manual for Assessing Safety Hardware (MASH).
- Refer to the CWZTCD for the requirements of Level 2 or Level 3 TMAs.
- Refer to the CWZTCD for a list of approved TMAs.
- TMAs are required on freeways unless otherwise noted in the plans.
- A TMA should be used anytime that it can be positioned 30 to 100 feet in advance of the area of crew exposure without adversely affecting the work performance.
- The only reason a TMA should not be required is when a work area is spread down the roadway and the work crew is an extended distance from the TMA.



BARRICADE AND CONSTRUCTION ARROW PANEL, REFLECTORS, WARNING LIGHTS & ATTENUATOR

BC (7) - 14

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REVISIONS									
9-07	8-14								
7-13									
DIST		COUNTY			SHEET NO.				

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GENERAL NOTES

- For long term stationary work zones on freeways, drums shall be used as the primary channelizing device.
- For intermediate term stationary work zones on freeways, drums should be used as the primary channelizing device but may be replaced in tangent sections by vertical panels, or 42" two-piece cones. In tangent sections one-piece cones may be used with the approval of the Engineer but only if personnel are present on the project at all times to maintain the cones in proper position and location.
- For short term stationary work zones on freeways, drums are the preferred channelizing device but may be replaced in tapers, transitions and tangent sections by vertical panels, two-piece cones or one-piece cones as approved by the Engineer.
- Drums and all related items shall comply with the requirements of the current version of the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD) and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Drums, bases, and related materials shall exhibit good workmanship and shall be free from objectionable marks or defects that would adversely affect their appearance or serviceability.
- The Contractor shall have a maximum of 24 hours to replace any plastic drums identified for replacement by the Engineer/Inspector. The replacement device must be an approved device.

GENERAL DESIGN REQUIREMENTS

Pre-qualified plastic drums shall meet the following requirements:

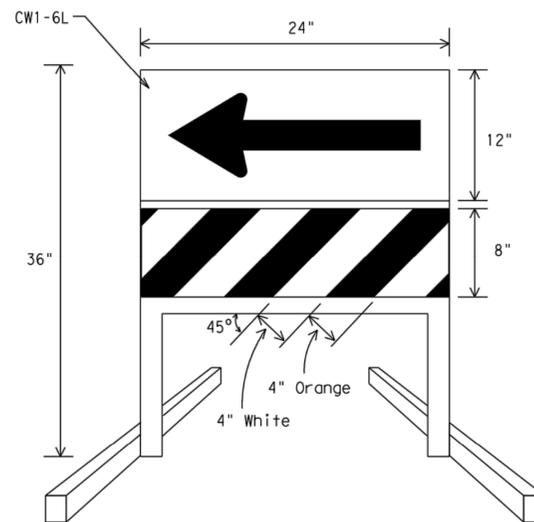
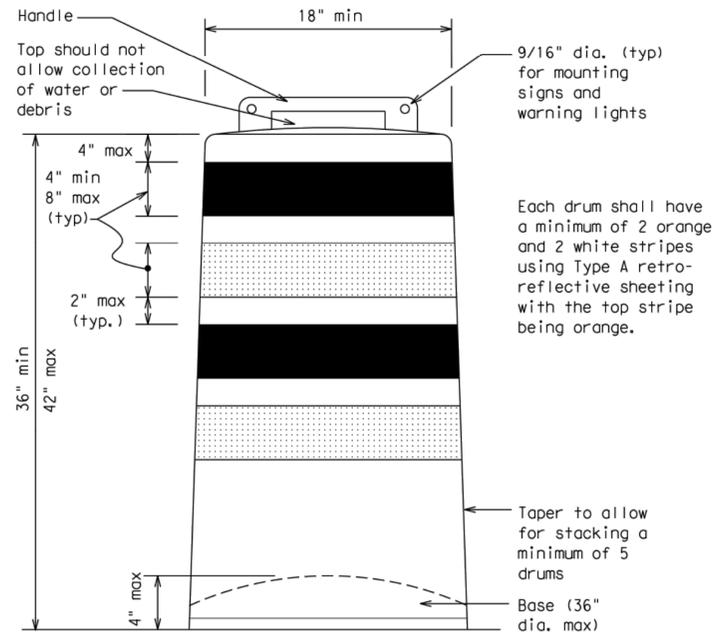
- Plastic drums shall be a two-piece design; the "body" of the drum shall be the top portion and the "base" shall be the bottom.
- The body and base shall lock together in such a manner that the body separates from the base when impacted by a vehicle traveling at a speed of 20 MPH or greater but prevents accidental separation due to normal handling and/or air turbulence created by passing vehicles.
- Plastic drums shall be constructed of lightweight flexible, and deformable materials. The Contractor shall NOT use metal drums or single piece plastic drums as channelization devices or sign supports.
- Drums shall present a profile that is a minimum of 18 inches in width at the 36 inch height when viewed from any direction. The height of drum unit (body installed on base) shall be a minimum of 36 inches and a maximum of 42 inches.
- The top of the drum shall have a built-in handle for easy pickup and shall be designed to drain water and not collect debris. The handle shall have a minimum of two widely spaced 9/16 inch diameter holes to allow attachment of a warning light, warning reflector unit or approved compliant sign.
- The exterior of the drum body shall have a minimum of four alternating orange and white retroreflective circumferential stripes not less than 4 inches nor greater than 8 inches in width. Any non-reflectorized space between any two adjacent stripes shall not exceed 2 inches in width.
- Bases shall have a maximum width of 36 inches, a maximum height of 4 inches, and a minimum of two footholds of sufficient size to allow base to be held down while separating the drum body from the base.
- Plastic drums shall be constructed of ultra-violet stabilized, orange, high-density polyethylene (HDPE) or other approved material.
- Drum body shall have a maximum unballasted weight of 11 lbs.
- Drum and base shall be marked with manufacturer's name and model number.

RETROREFLECTIVE SHEETING

- The stripes used on drums shall be constructed of sheeting meeting the color and retroreflectivity requirements of Departmental Materials Specification DMS-8300, "Sign Face Materials." Type A reflective sheeting shall be supplied unless otherwise specified in the plans.
- The sheeting shall be suitable for use on and shall adhere to the drum surface such that, upon vehicular impact, the sheeting shall remain adhered in-place and exhibit no delaminating, cracking, or loss of retroreflectivity other than that loss due to abrasion of the sheeting surface.

BALLAST

- Unballasted bases shall be large enough to hold up to 50 lbs. of sand. This base, when filled with the ballast material, should weigh between 35 lbs (minimum) and 50 lbs (maximum). The ballast may be sand in one to three sandbags separate from the base, sand in a sand-filled plastic base, or other ballasting devices as approved by the Engineer. Stacking of sandbags will be allowed, however height of sandbags above pavement surface may not exceed 12 inches.
- Bases with built-in ballast shall weigh between 40 lbs. and 50 lbs. Built-in ballast can be constructed of an integral crumb rubber base or a solid rubber base.
- Recycled truck tire sidewalls may be used for ballast on drums approved for this type of ballast on the CWZTCD list.
- The ballast shall not be heavy objects, water, or any material that would become hazardous to motorists, pedestrians, or workers when the drum is struck by a vehicle.
- When used in regions susceptible to freezing, drums shall have drainage holes in the bottoms so that water will not collect and freeze becoming a hazard when struck by a vehicle.
- Ballast shall not be placed on top of drums.
- Adhesives may be used to secure base of drums to pavement.



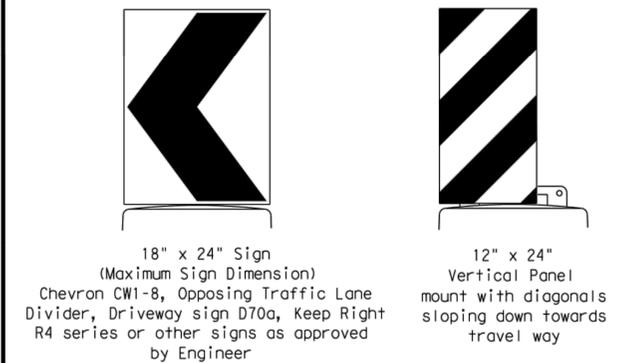
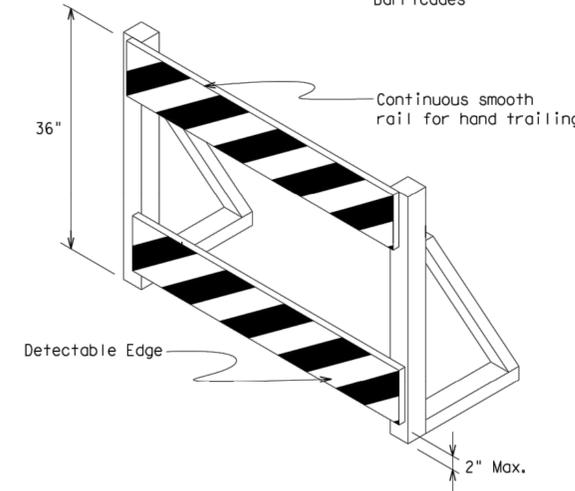
DIRECTION INDICATOR BARRICADE

- The Direction Indicator Barricade may be used in tapers, transitions, and other areas where specific directional guidance to drivers is necessary.
- If used, the Direction Indicator Barricade should be used in series to direct the driver through the transition and into the intended travel lane.
- The Direction Indicator Barricade shall consist of One-Direction Large Arrow (CW1-6) sign in the size shown with a black arrow on a background of Type B_{FL} or Type C_{FL} Orange retroreflective sheeting above a rail with Type A retroreflective sheeting in alternating 4" white and orange stripes sloping downward at an angle of 45 degrees in the direction road users are to pass. Sheeting types shall be as per DMS 8300.
- Double arrows on the Direction Indicator Barricade will not be allowed.
- Approved manufacturers are shown on the CWZTCD List. Ballast shall be as approved by the manufacturers instructions.

DETECTABLE PEDESTRIAN BARRICADES

- When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.
- Where pedestrians with visual disabilities normally use the closed sidewalk, a device that is detectable by a person with a visual disability traveling with the aid of a long cane shall be placed across the full width of the closed sidewalk.
- Detectable pedestrian barricades similar to the one pictured above, longitudinal channelizing devices, some concrete barriers, and wood or chain link fencing with a continuous detectable edging can satisfactorily delineate a pedestrian path.
- Tape, rope, or plastic chain strung between devices are not detectable, do not comply with the design standards in the "Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG)" and should not be used as a control for pedestrian movements.
- Warning lights shall not be attached to detectable pedestrian barricades.
- Detectable pedestrian barricades may use 8" nominal barricade rails as shown on BC(10) provided that the top rail provides a smooth continuous rail suitable for hand trailing with no splinters, burrs, or sharp edges.

This detail is not intended for fabrication. See note 3 and the CWZTCD list for providers of approved Detectable Pedestrian Barricades



Plywood, Aluminum or Metal sign substrates shall NOT be used on plastic drums

SIGNS, CHEVRONS, AND VERTICAL PANELS MOUNTED ON PLASTIC DRUMS

- Signs used on plastic drums shall be manufactured using substrates listed on the CWZTCD.
- Chevrons and other work zone signs with an orange background shall be manufactured with Type B_{FL} or Type C_{FL} Orange sheeting meeting the color and retroreflectivity requirements of DMS-8300, "Sign Face Material," unless otherwise specified in the plans.
- Vertical Panels shall be manufactured with orange and white sheeting meeting the requirements of DMS-8300 Type A Diagonal stripes on Vertical Panels shall slope down toward the intended traveled lane.
- Other sign messages (text or symbolic) may be used as approved by the Engineer. Sign dimensions shall not exceed 18 inches in width or 24 inches in height, except for the R9 series signs discussed in note 8 below.
- Signs shall be installed using a 1/2 inch bolt (nominal) and nut, two washers, and one locking washer for each connection.
- Mounting bolts and nuts shall be fully engaged and adequately torqued. Bolts should not extend more than 1/2 inch beyond nuts.
- Chevrons may be placed on drums on the outside of curves, on merging tapers or on shifting tapers. When locations they may be placed on every drum or more than on every third drum. A minimum of three should be used at each location called for in the plans.
- R9-9, R9-10, R9-11 and R9-11a Sidewalk Closed are 24 inches wide may be mounted on plastic drums with the approval of the Engineer.

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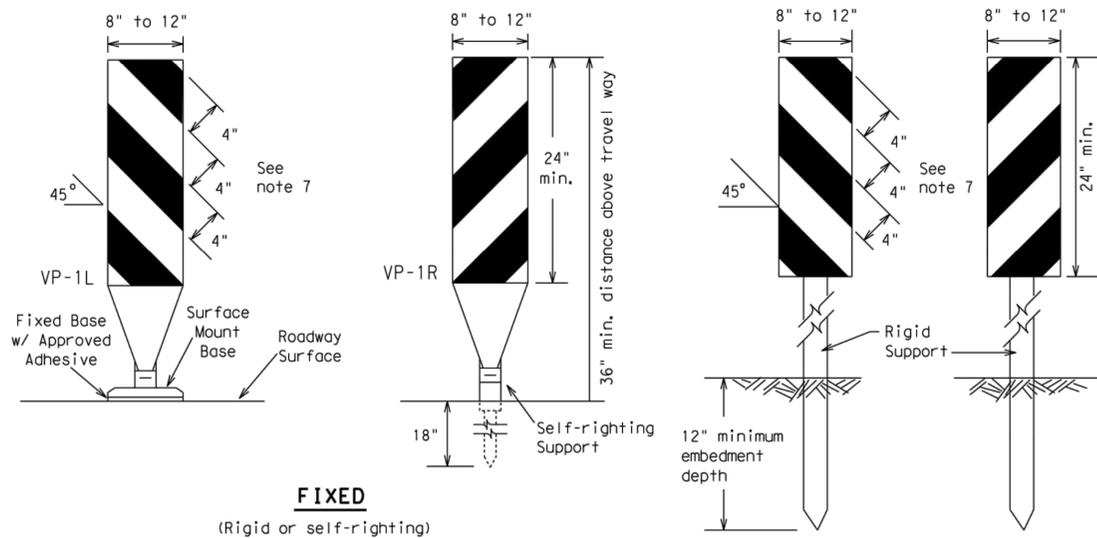


BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (8) - 14

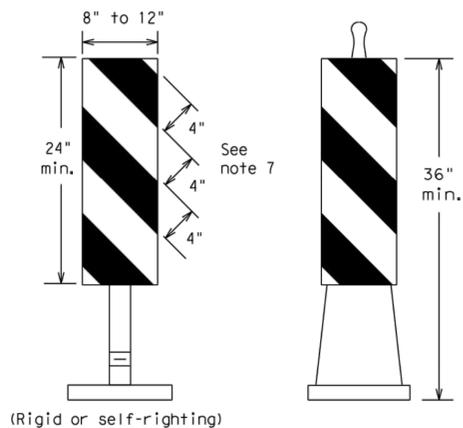
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FIXED
(Rigid or self-righting)

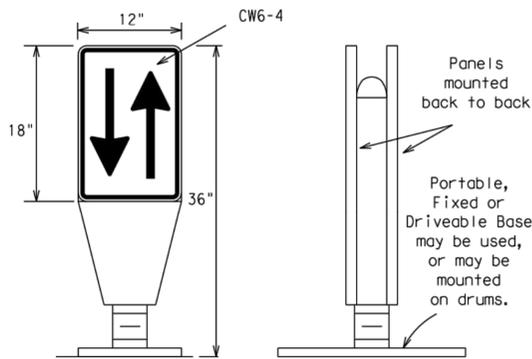
DRIVEABLE



PORTABLE

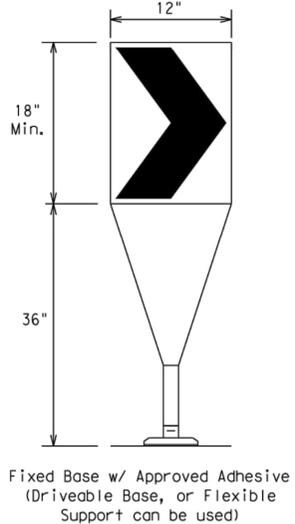
VERTICAL PANELS (VPs)

- Vertical Panels (VP's) are normally used to channelize traffic or divide opposing lanes of traffic.
- VP's may be used in daytime or nighttime situations. They may be used at the edge of shoulder drop-offs and other areas such as lane transitions where positive daytime and nighttime delineation is required. The Engineer/Inspector shall refer to the Roadway Design Manual Appendix B "Treatment of Pavement Drop-offs in Work Zones" for additional guidelines on the use of VP's for drop-offs.
- VP's should be mounted back to back if used at the edge of cuts adjacent to two-way two lane roadways. Stripes are to be reflective orange and reflective white and should always slope downward toward the travel lane.
- VP's used on expressways and freeways or other high speed roadways, may have more than 270 square inches of retroreflective area facing traffic.
- Self-righting supports are available with portable base. See "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- Sheeting for the VP's shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300, unless noted otherwise.
- Where the height of reflective material on the vertical panel is 36 inches or greater, a panel stripe of 6 inches shall be used.



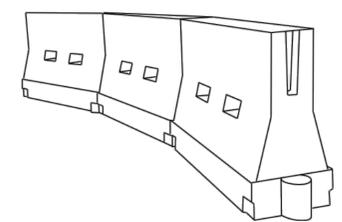
OPPOSING TRAFFIC LANE DIVIDERS (OTLD)

- Opposing Traffic Lane Dividers (OTLD) are delineation devices designed to convert a normal one-way roadway section to two-way operation. OTLD's are used on temporary centerlines. The upward and downward arrows on the sign's face indicate the direction of traffic on either side of the divider. The base is secured to the pavement with an adhesive or rubber weight to minimize movement caused by a vehicle impact or wind gust.
- The OTLD may be used in combination with 42" cones or VPs.
- Spacing between the OTLD shall not exceed 500 feet. 42" cones or VPs placed between the OTLD's should not exceed 100 foot spacing.
- The OTLD shall be orange with a black non-reflective legend. Sheeting for the OTLD shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.



CHEVRONS

- The chevron shall be a vertical rectangle with a minimum size of 12 by 18 inches.
- Chevrons are intended to give notice of a sharp change of alignment with the direction of travel and provide additional emphasis and guidance for vehicle operators with regard to changes in horizontal alignment of the roadway.
- Chevrons, when used, shall be erected on the outside of a sharp curve or turn, or on the far side of an intersection. They shall be in line with and at right angles to approaching traffic. Spacing should be such that the motorist always has three in view, until the change in alignment eliminates its need.
- To be effective, the chevron should be visible for at least 500 feet.
- Chevrons shall be orange with a black nonreflective legend. Sheeting for the chevron shall be retroreflective Type B_{FL} or Type C_{FL} conforming to Departmental Material Specification DMS-8300, unless noted otherwise. The legend shall meet the requirements of DMS-8300.
- For Long Term Stationary use on tapers or transitions on freeways and divided highways self-righting chevrons may be used to supplement plastic drums but not to replace plastic drums.



LONGITUDINAL CHANNELIZING DEVICES (LCD)

- LCDs are crashworthy, lightweight, deformable devices that are highly visible, have good target value and can be connected together. They are not designed to contain or redirect a vehicle on impact.
- LCDs may be used instead of a line of cones or drums.
- LCDs shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- LCDs should not be used to provide positive protection for obstacles, pedestrians or workers.
- LCDs shall be supplemented with retroreflective delineation as required for temporary barriers on BC(7) when placed roughly parallel to the travel lanes.
- LCDs used as barricades placed perpendicular to traffic should have at least one row of reflective sheeting meeting the requirements for barricade rails as shown on BC(10) placed near the top of the LCD along the full length of the device.

WATER BALLASTED SYSTEMS USED AS BARRIERS

- Water ballasted systems used as barriers shall not be used solely to channelize road users, but also to protect the work space per the appropriate NCHRP 350 crashworthiness requirements based on roadway speed and barrier application.
- Water ballasted systems used to channelize vehicular traffic shall be supplemented with retroreflective delineation or channelizing devices to improve daytime/nighttime visibility. They may also be supplemented with pavement markings.
- Water ballasted systems used as barriers shall be placed in accordance to application and installation requirements specific to the device, and used only when shown on the CWZTCD list.
- Water ballasted systems used as barriers should not be used for a merging taper except in low speed (less than 45 MPH) urban areas. When used on a taper in a low speed urban area, the taper shall be delineated and the taper length should be designed to optimize road user operations considering the available geometric conditions.
- When water ballasted systems used as barriers have blunt ends exposed to traffic, they should be attenuated as per manufacturer recommendations or flared to a point outside the clear zone.

If used to channelize pedestrians, longitudinal channelizing devices or water ballasted systems must have a continuous detectable bottom for users of long canes and the top of the unit shall not be less than 32 inches in height.

HOLLOW OR WATER BALLASTED SYSTEMS USED AS LONGITUDINAL CHANNELIZING DEVICES OR BARRIERS

GENERAL NOTES

- Work Zone channelizing devices illustrated on this sheet may be installed in close proximity to traffic and are suitable for use on high or low speed roadways. The Engineer/Inspector shall ensure that spacing and placement is uniform and in accordance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Channelizing devices shown on this sheet may have a driveable, fixed or portable base. The requirement for self-righting channelizing devices must be specified in the General Notes or other plan sheets.
- Channelizing devices on self-righting supports should be used in work zone areas where channelizing devices are frequently impacted by errant vehicles or vehicle related wind gusts making alignment of the channelizing devices difficult to maintain. Locations of these devices shall be detailed elsewhere in the plans. These devices shall conform to the TMUTCD and the "Compliant Work Zone Traffic Control Devices List" (CWZTCD).
- The Contractor shall maintain devices in a clean condition and replace damaged, nonreflective, faded, or broken devices and bases as required by the Engineer/Inspector. The Contractor shall be required to maintain proper device spacing and alignment.
- Portable bases shall be fabricated from virgin and/or recycled rubber. The portable bases shall weigh a minimum of 30 lbs.
- Pavement surfaces shall be prepared in a manner that ensures proper bonding between the adhesives, the fixed mount bases and the pavement surface. Adhesives shall be prepared and applied according to the manufacturer's recommendations.
- The installation and removal of channelizing devices shall not cause detrimental effects to the final pavement surfaces, including pavement surface discoloration or surface integrity. Driveable bases shall not be permitted on final pavement surfaces. The Engineer/Inspector shall approve all application and removal procedures of fixed bases.

Posted Speed X	Formula	Minimum Desirable Taper Lengths X X			Suggested Maximum Spacing of Channelizing Devices	
		10' Offset	11' Offset	12' Offset	On a Taper	On a Tangent
30	L = WS ² / 60	150'	165'	180'	30'	60'
35		205'	225'	245'	35'	70'
40		265'	295'	320'	40'	80'
45	L = WS	450'	495'	540'	45'	90'
50		500'	550'	600'	50'	100'
55		550'	605'	660'	55'	110'
60		600'	660'	720'	60'	120'
65		650'	715'	780'	65'	130'
70		700'	770'	840'	70'	140'
75		750'	825'	900'	75'	150'
80		800'	880'	960'	80'	160'

XX Taper lengths have been rounded off.
L=Length of Taper (FT.) W=Width of Offset (FT.)
S=Posted Speed (MPH)

SUGGESTED MAXIMUM SPACING OF CHANNELIZING DEVICES
MINIMUM DESIRABLE TAPE

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (9) - 14

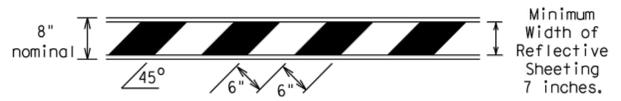
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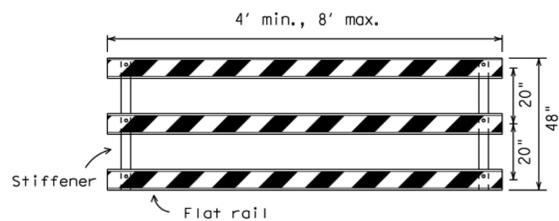
TYPE 3 BARRICADES

1. Refer to the Compliant Work Zone Traffic Control Devices List (CWZTCD) for details of the Type 3 Barricades and a list of all materials used in the construction of Type 3 Barricades.
2. Type 3 Barricades shall be used at each end of construction projects closed to all traffic.
3. Barricades extending across a roadway should have stripes that slope downward in the direction toward which traffic must turn in detouring. When both right and left turns are provided, the chevron striping may slope downward in both directions from the center of the barricade. Where no turns are provided at a closed road striping should slope downward in both directions toward the center of roadway.
4. Striping of rails, for the right side of the roadway, should slope downward to the left. For the left side of the roadway, striping should slope downward to the right.
5. Identification markings may be shown only on the back of the barricade rails. The maximum height of letters and/or company logos used for identification shall be 1".
6. Barricades shall not be placed parallel to traffic unless an adequate clear zone is provided.
7. Warning lights shall NOT be installed on barricades.
8. Where barricades require the use of weights to keep from turning over, the use of sandbags with dry, cohesionless sand is recommended. The sandbags will be tied shut to keep the sand from spilling and to maintain a constant weight. Sand bags shall not be stacked in a manner that covers any portion of a barricade rails reflective sheeting. Rock, concrete, iron, steel or other solid objects will NOT be permitted. Sandbags should weigh a minimum of 35 lbs and a maximum of 50 lbs. Sandbags shall be made of a durable material that tears upon vehicular impact. Rubber (such as tire inner tubes) shall not be used for sandbags. Sandbags shall only be placed along or upon the base supports of the device and shall not be suspended above ground level or hung with rope, wire, chains or other fasteners.
9. Sheeting for barricades shall be retroreflective Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.

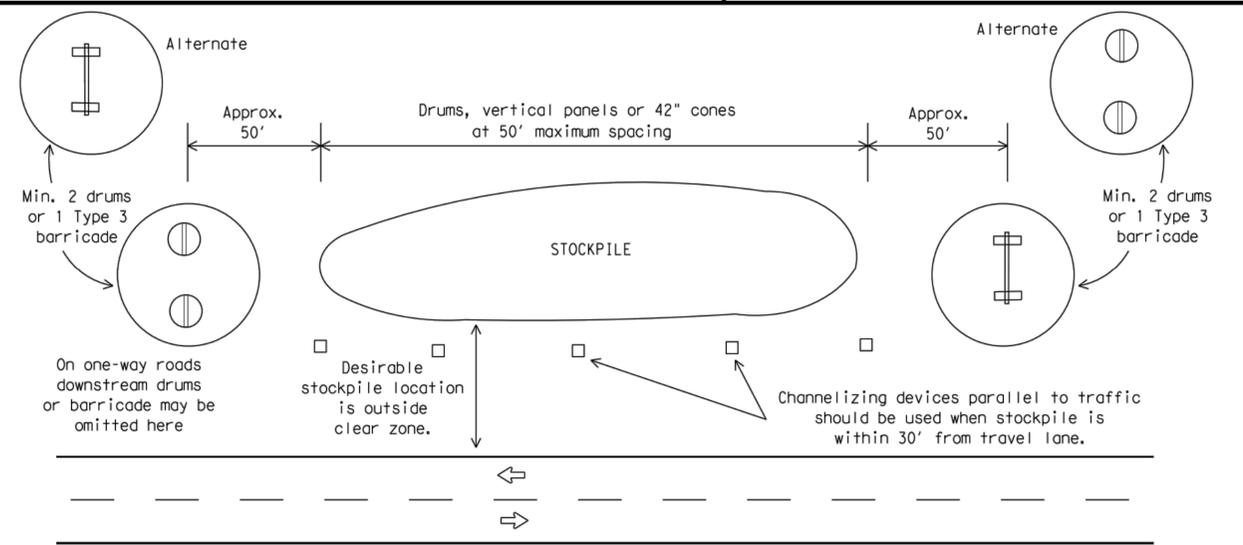
Barricades shall NOT be used as a sign support.



TYPICAL STRIPING DETAIL FOR BARRICADE RAIL

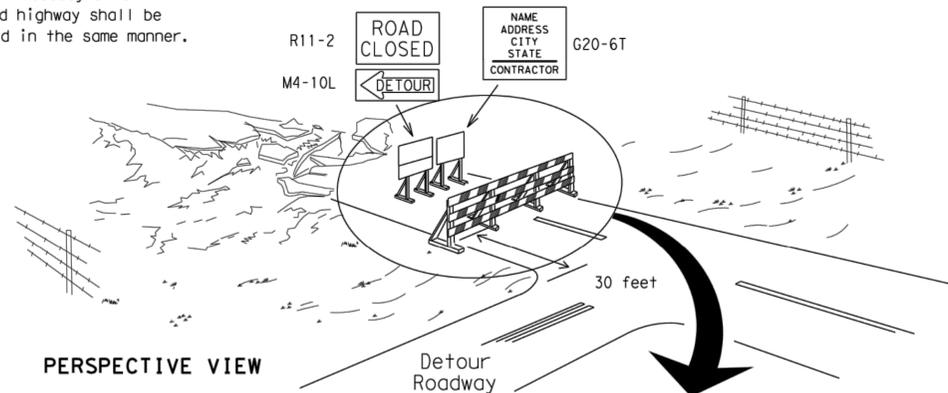


TYPICAL PANEL DETAIL FOR SKID OR POST TYPE BARRICADES



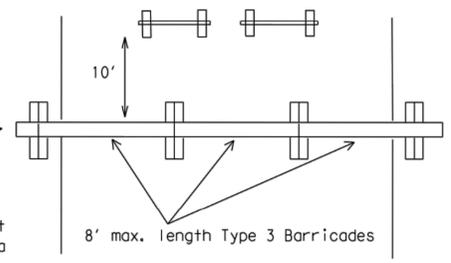
TRAFFIC CONTROL FOR MATERIAL STOCKPILES

Each roadway of a divided highway shall be barricaded in the same manner.



PERSPECTIVE VIEW

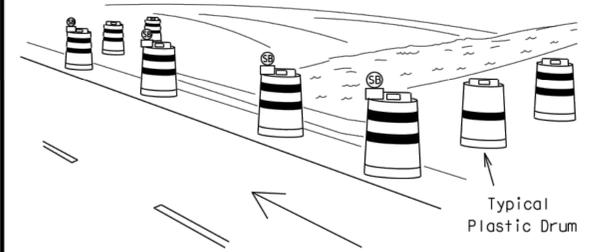
The three rails on Type 3 barricades shall be reflectorized orange and reflective white stripes on one side facing one-way traffic and both sides for two-way traffic. Barricade striping should slant downward in the direction of detour.



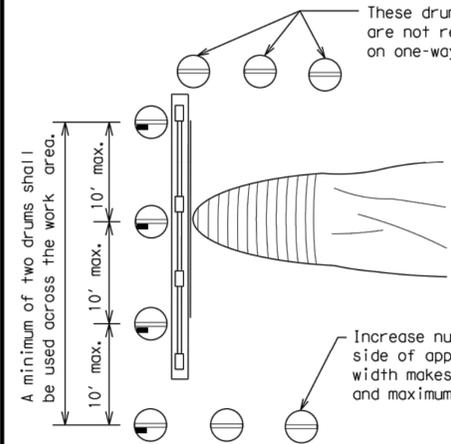
PLAN VIEW

1. Signs should be mounted on independent supports at a 7 foot mounting height in center of roadway. The signs should be a minimum of 10 feet behind Type 3 Barricades.
2. Advance signing shall be as specified elsewhere in the plans.

TYPE 3 BARRICADE (POST AND SKID) TYPICAL APPLICATION



PERSPECTIVE VIEW

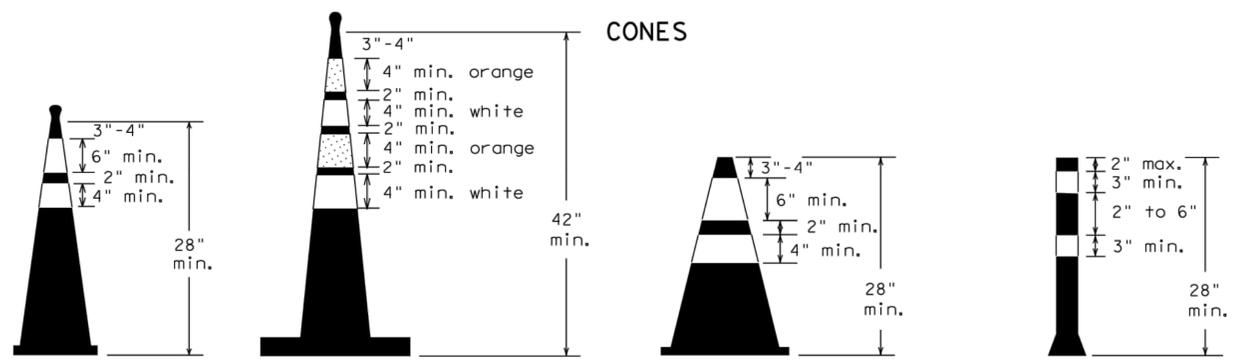


PLAN VIEW

1. Where positive redirection capability is provided, drums may be omitted.
2. Plastic construction fencing may be used with drums for safety as required in the plans.
3. Vertical Panels on flexible support may be substituted for drums when the shoulder width is less than 4 feet.
4. When the shoulder width is greater than 12 feet, steady-burn lights may be omitted if drums are used.
5. Drums must extend the length of the culvert widening.

LEGEND	
	Plastic drum
	Plastic drum with steady burn light or yellow warning reflector
	Steady burn warning light or yellow warning reflector

CULVERT WIDENING OR OTHER ISOLATED WORK WITHIN THE PROJECT LIMITS



Two-Piece cones

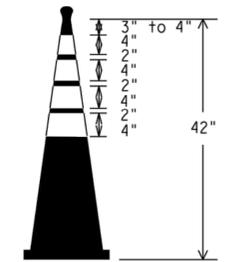
One-Piece cones

Tubular Marker

28" Cones shall have a minimum weight of 9 1/2 lbs.
 42" 2-piece cones shall have a minimum weight of 30 lbs. including base.

1. Traffic cones and tubular markers shall be predominantly orange, and meet the height and weight requirements shown above.
2. One-piece cones have the body and base of the cone molded in one consolidated unit. Two-piece cones have a cone shaped body and a separate rubber base, or ballast, that is added to keep the device upright and in place.
3. Two-piece cones may have a handle or loop extending up to 8" above the minimum height shown, in order to aid in retrieving the device.
4. Cones or tubular markers used at night shall have white or white and orange reflective bands as shown above. The reflective bands shall have a smooth, sealed outer surface and meet the requirements of Departmental Material Specification DMS-8300 Type A.
5. 28" cones and tubular markers are generally suitable for short duration and short-term stationary work as defined on BC(4). These should not be used for intermediate-term or long-term stationary work unless personnel is on-site to maintain them in their proper upright position.
6. 42" two-piece cones, vertical panels or drums are suitable for all work zone durations.
7. Cones or tubular markers used on each project should be of the same size and shape.

THIS DEVICE SHALL NOT BE USED ON PROJECTS LET AFTER MARCH 2014.



EDGE LINE CHANNELIZER

1. This device is intended only for use in place of a vertical panel to channelize traffic by indicating the edge of the travel lane. It is not intended to be used in transitions or tapers.
2. This device shall not be used to separate lanes of traffic (opposing or otherwise) or warn of objects.
3. This device is based on a 42 inch, two-piece cone with striping pattern: four 4 inch retroreflective bands, with approximate 2 inch gap between bands. The color of the bands correspond to the color of the edgeline (yellow for left edge, white for right edgeline) for which the device is substituted. The reflectorized bands shall be Type A conforming to Departmental Material Specification DMS-8300 unless otherwise noted.
4. The base must weigh a minimum of 30 lbs.

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BARRICADE AND CONSTRUCTION CHANNELIZING DEVICES

BC (10) - 14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
© TxDOT November 2002	CONT	SECT	JOB	HIGHWAY
REVISIONS				
9-07	8-14			
7-13				
	DIST	COUNTY	SHEET NO.	

WORK ZONE PAVEMENT MARKINGS

GENERAL

- The Contractor shall be responsible for maintaining work zone and existing pavement markings, in accordance with the standard specifications and special provisions, on all roadways open to traffic within the CSJ limits unless otherwise stated in the plans.
- Color, patterns and dimensions shall be in conformance with the "Texas Manual on Uniform Traffic Control Devices" (TMUTCD).
- Additional supplemental pavement marking details may be found in the plans or specifications.
- Pavement markings shall be installed in accordance with the TMUTCD and as shown on the plans.
- When short term markings are required on the plans, short term markings shall conform with the TMUTCD, the plans and details as shown on the Standard Plan Sheet WZ(STPM).
- When standard pavement markings are not in place and the roadway is opened to traffic, DO NOT PASS signs shall be erected to mark the beginning of the sections where passing is prohibited and PASS WITH CARE signs at the beginning of sections where passing is permitted.
- All work zone pavement markings shall be installed in accordance with Item 662, "Work Zone Pavement Markings."

RAISED PAVEMENT MARKERS

- Raised pavement markers are to be placed according to the patterns on BC(12).
- All raised pavement markers used for work zone markings shall meet the requirements of Item 672, "RAISED PAVEMENT MARKERS" and Departmental Material Specification DMS-4200 or DMS-4300.

PREFABRICATED PAVEMENT MARKINGS

- Removable prefabricated pavement markings shall meet the requirements of DMS-8241.
- Non-removable prefabricated pavement markings (foil back) shall meet the requirements of DMS-8240.

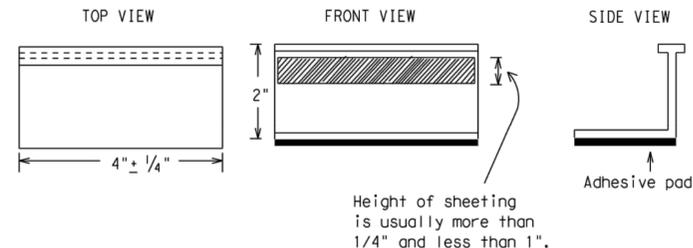
MAINTAINING WORK ZONE PAVEMENT MARKINGS

- The Contractor will be responsible for maintaining work zone pavement markings within the work limits.
- Work zone pavement markings shall be inspected in accordance with the frequency and reporting requirements of work zone traffic control device inspections as required by Form 599.
- The markings should provide a visible reference for a minimum distance of 300 feet during normal daylight hours and 160 feet when illuminated by automobile low-beam headlights at night, unless sight distance is restricted by roadway geometrics.
- Markings failing to meet this criteria within the first 30 days after placement shall be replaced at the expense of the Contractor as per Specification Item 662.

REMOVAL OF PAVEMENT MARKINGS

- Pavement markings that are no longer applicable, could create confusion or direct a motorist toward or into the closed portion of the roadway shall be removed or obliterated before the roadway is opened to traffic.
- The above shall not apply to detours in place for less than three days, where flaggers and/or sufficient channelizing devices are used in lieu of markings to outline the detour route.
- Pavement markings shall be removed to the fullest extent possible, so as not to leave a discernable marking. This shall be by any method approved by TxDOT Specification Item 677 for "Eliminating Existing Pavement Markings and Markers".
- The removal of pavement markings may require resurfacing or seal coating portions of the roadway as described in Item 677.
- Subject to the approval of the Engineer, any method that proves to be successful on a particular type pavement may be used.
- Blast cleaning may be used but will not be required unless specifically shown in the plans.
- Over-painting of the markings SHALL NOT BE permitted.
- Removal of raised pavement markers shall be as directed by the Engineer.
- Removal of existing pavement markings and markers will be paid for directly in accordance with Item 677, "ELIMINATING EXISTING PAVEMENT MARKINGS AND MARKERS," unless otherwise stated in the plans.
- Black-out marking tape may be used to cover conflicting existing markings for periods less than two weeks when approved by the Engineer.

Temporary Flexible-Reflective Roadway Marker Tabs



**STAPLES OR NAILS SHALL NOT BE USED TO SECURE
TEMPORARY FLEXIBLE-REFLECTIVE ROADWAY MARKER
TABS TO THE PAVEMENT SURFACE**

- Temporary flexible-reflective roadway marker tabs used as guidemarks shall meet the requirements of DMS-8242.
- Tabs detailed on this sheet are to be inspected and accepted by the Engineer or designated representative. Sampling and testing is not normally required, however at the option of the Engineer, either "A" or "B" below may be imposed to assure quality before placement on the roadway.
 - Select five (5) or more tabs at random from each lot or shipment and submit to the Construction Division, Materials and Pavement Section to determine specification compliance.
 - Select five (5) tabs and perform the following test. Affix five (5) tabs at 24 inch intervals on an asphaltic pavement in a straight line. Using a medium size passenger vehicle or pickup, run over the markers with the front and rear tires at a speed of 35 to 40 miles per hour, four (4) times in each direction. No more than one (1) out of the five (5) reflective surfaces shall be lost or displaced as a result of this test.
- Small design variances may be noted between tab manufacturers.
- See Standard Sheet WZ(STPM) for tab placement on new pavements. See Standard Sheet TCP(7-1) for tab placement on seal coat work.

RAISED PAVEMENT MARKERS USED AS GUIDEMARKS

- Raised pavement markers used as guidemarks shall be from the approved product list, and meet the requirements of DMS-4200.
- All temporary construction raised pavement markers provided on a project shall be of the same manufacturer.
- Adhesive for guidemarks shall be bituminous material hot applied or butyl rubber pad for all surfaces, or thermoplastic for concrete surfaces.

Guidemarks shall be designated as:
 YELLOW - (two amber reflective surfaces with yellow body).
 WHITE - (one silver reflective surface with white body).

DEPARTMENTAL MATERIAL SPECIFICATIONS	
PAVEMENT MARKERS (REFLECTORIZED)	DMS-4200
TRAFFIC BUTTONS	DMS-4300
EPOXY AND ADHESIVES	DMS-6100
BITUMINOUS ADHESIVE FOR PAVEMENT MARKERS	DMS-6130
PERMANENT PREFABRICATED PAVEMENT MARKINGS	DMS-8240
TEMPORARY REMOVABLE, PREFABRICATED PAVEMENT MARKINGS	DMS-8241
TEMPORARY FLEXIBLE, REFLECTIVE ROADWAY MARKER TABS	DMS-8242

A list of prequalified reflective raised pavement markers, non-reflective traffic buttons, roadway marker tabs and other pavement markings can be found at the Material Producer List web address shown on BC(1).

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SHEET 11 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKINGS

BC(11) - 14

FILE: bc-14.dgn	DN: TxDOT	CK: TxDOT	DW: TxDOT	CK: TxDOT
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REVISIONS				
2-98 9-07				
1-02 7-13				
11-02 8-14				
	DIST	COUNTY	SHEET NO.	

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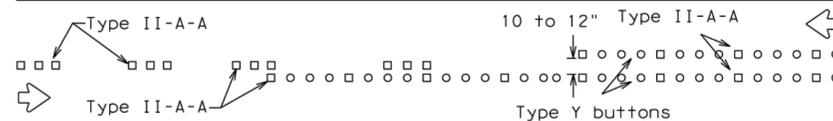
DATE:
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\\MSA-BER\ER31P\DRIVE\PROJECTS\15454008\CAD\30\SHEET\SLV\264 - C - TXDOT - BC14 - 0011.DWG

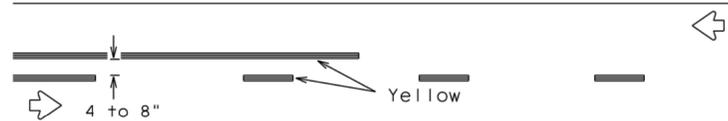
PAVEMENT MARKING PATTERNS



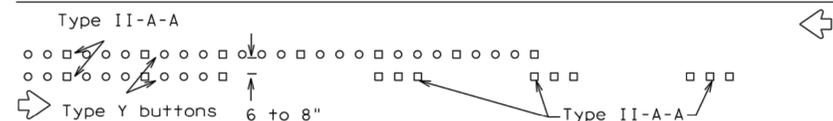
REFLECTORIZED PAVEMENT MARKINGS - PATTERN A



RAISED PAVEMENT MARKERS - PATTERN A



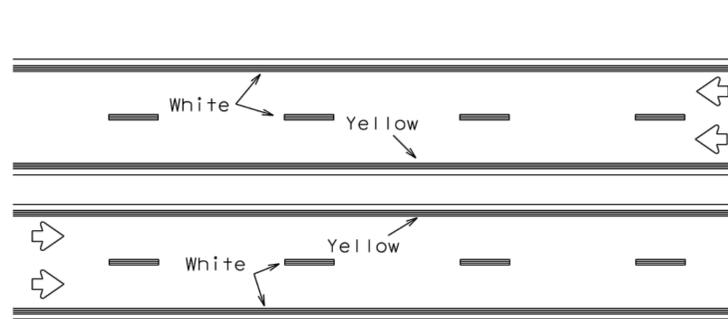
REFLECTORIZED PAVEMENT MARKINGS - PATTERN B



RAISED PAVEMENT MARKERS - PATTERN B

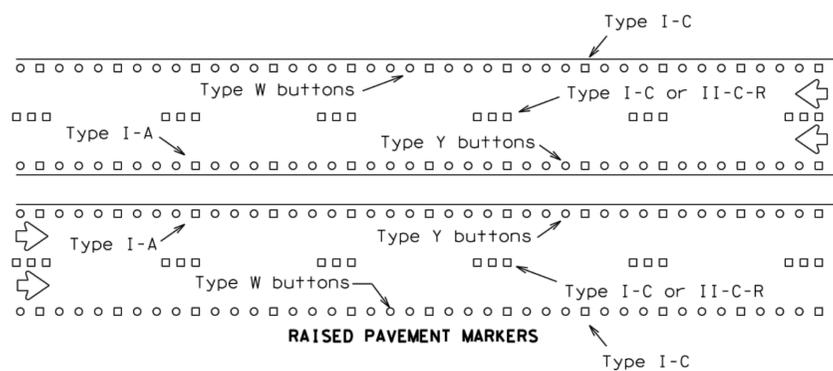
Pattern A is the TXDOT Standard, however Pattern B may be used if approved by the Engineer. Prefabricated markings may be substituted for reflectorized pavement markings.

CENTER LINE & NO-PASSING ZONE BARRIER LINES FOR TWO-LANE, TWO-WAY HIGHWAYS



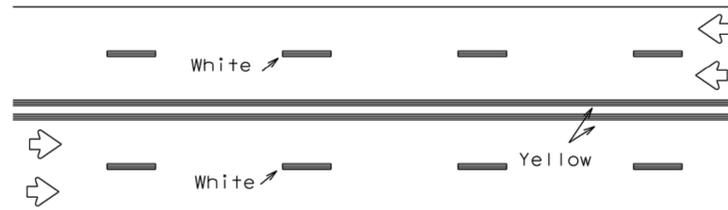
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



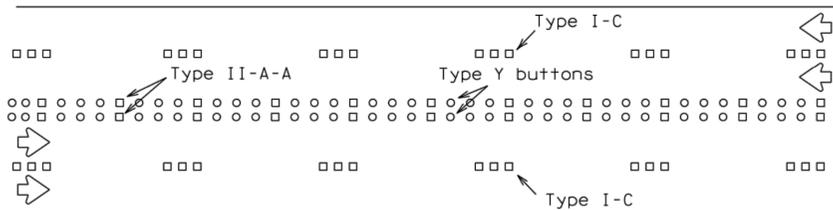
RAISED PAVEMENT MARKERS

EDGE & LANE LINES FOR DIVIDED HIGHWAY



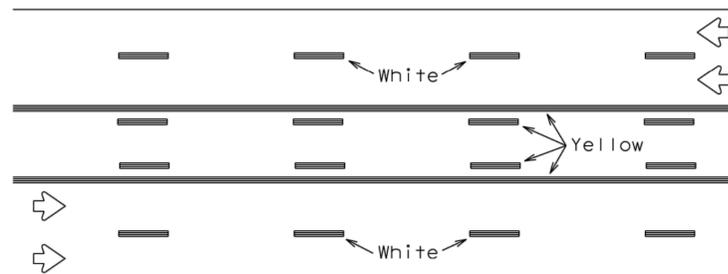
REFLECTORIZED PAVEMENT MARKINGS

Prefabricated markings may be substituted for reflectorized pavement markings.



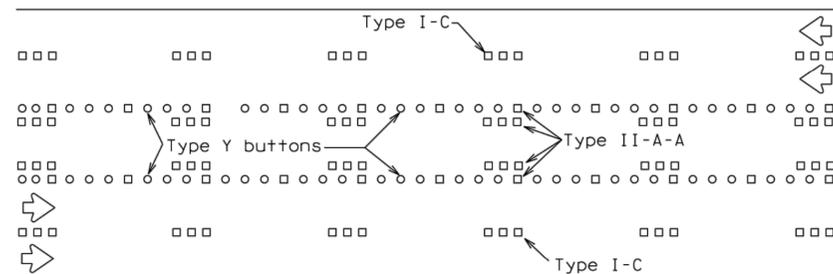
RAISED PAVEMENT MARKERS

LANE & CENTER LINES FOR MULTILANE UNDIVIDED HIGHWAYS



REFLECTORIZED PAVEMENT MARKINGS

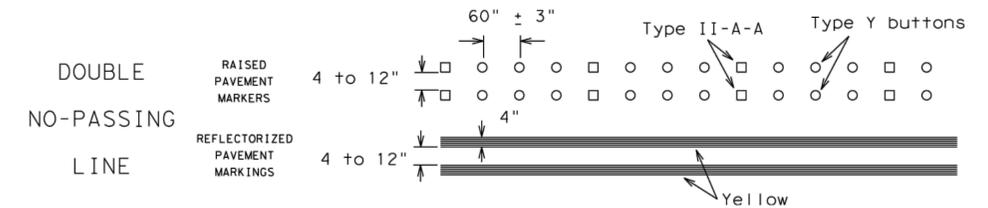
Prefabricated markings may be substituted for reflectorized pavement markings.



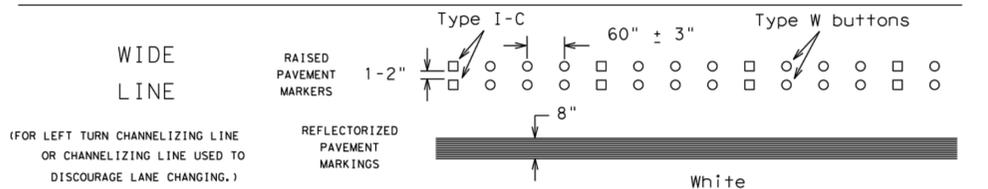
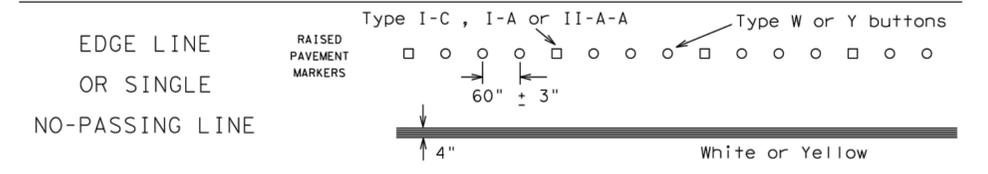
RAISED PAVEMENT MARKERS

TWO-WAY LEFT TURN LANE

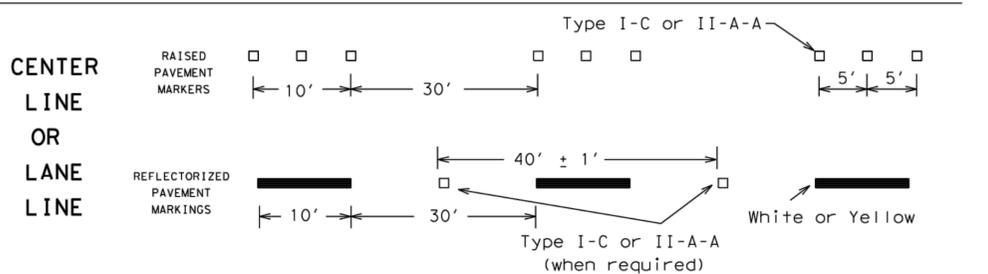
STANDARD WORK ZONE PAVEMENT MARKINGS DETAILS



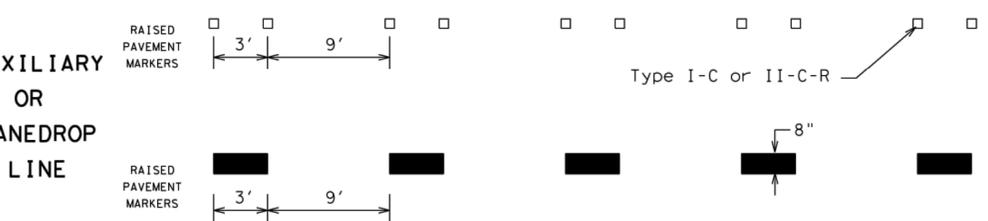
SOLID LINES



BROKEN LINES

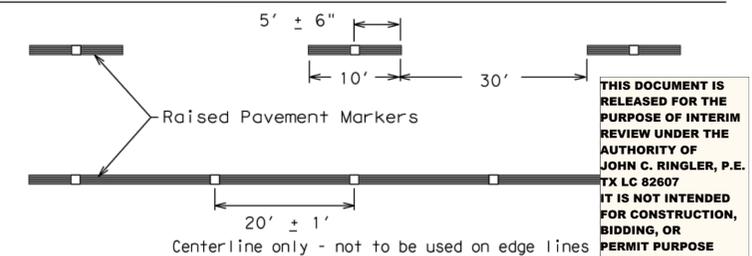


AUXILIARY OR LANEDROP LINE



REMOVABLE MARKINGS WITH RAISED PAVEMENT MARKERS

If raised pavement markers are used to supplement REMOVABLE markings, the markers shall be applied to the top of the tape at the approximate mid length of tape used for broken lines or at 20 foot spacing for solid lines. This allows an easier removal of raised pavement markers and tape.



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SHEET 12 OF 12



BARRICADE AND CONSTRUCTION PAVEMENT MARKING PATTERNS

BC (12) - 14

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REVISIONS									
1-97	9-07								
2-98	7-13	DIST	COUNTY			SHEET NO.			
11-02	8-14								

Raised pavement markers used as standard pavement markings shall be from the approved products list and meet the requirements of Item 672 "RAISED PAVEMENT MARKERS."

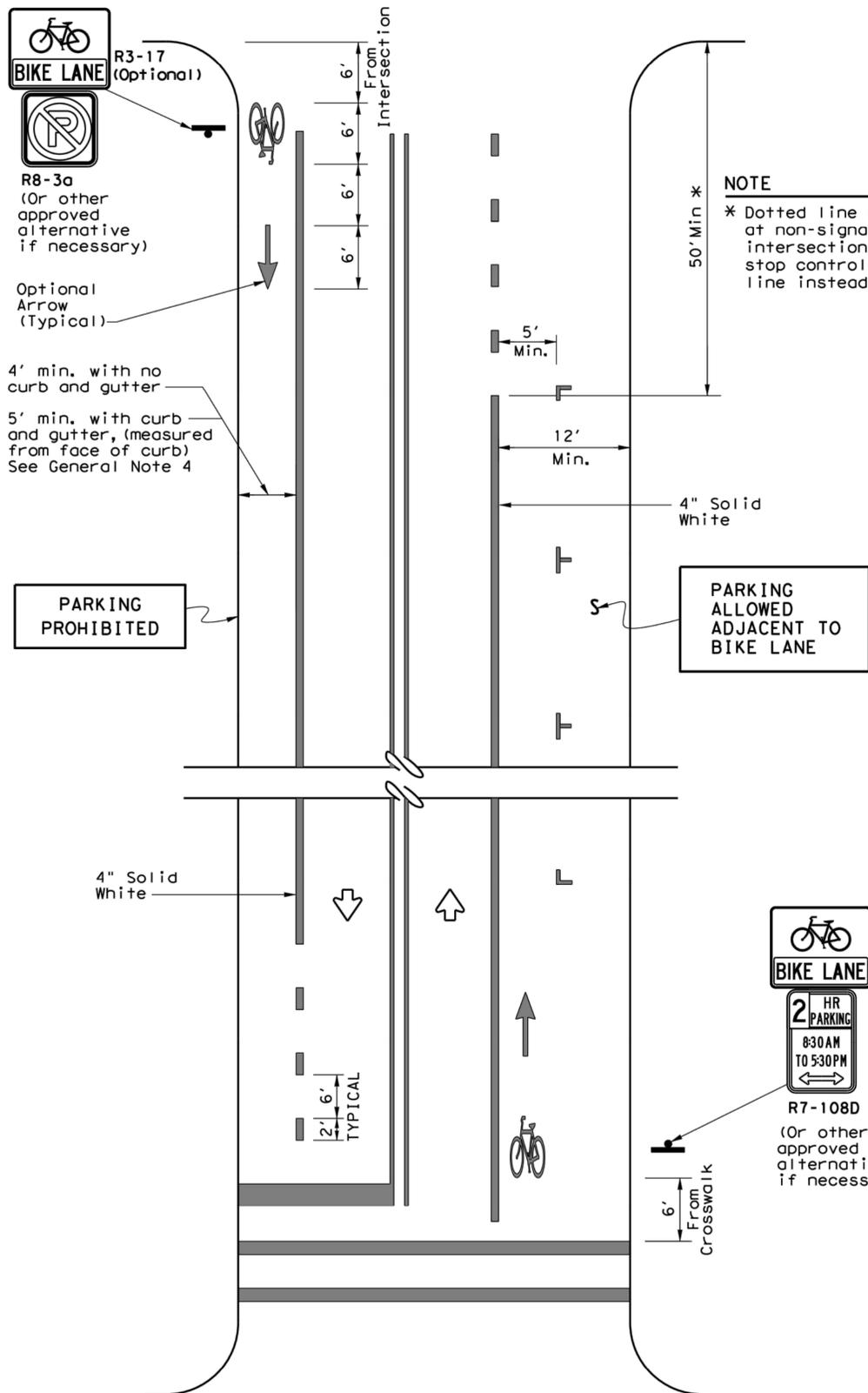
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DATE:
FILE:



NOTES

- Bicycle lane pavement markings typically repeated after each intersection or signalized driveway.
- On uninterrupted sections of roadway, bicycle lane pavement markings typically repeated as follows:
 -1200' for 45 MPH or less roads
 -2500' for 50 MPH and greater roads.

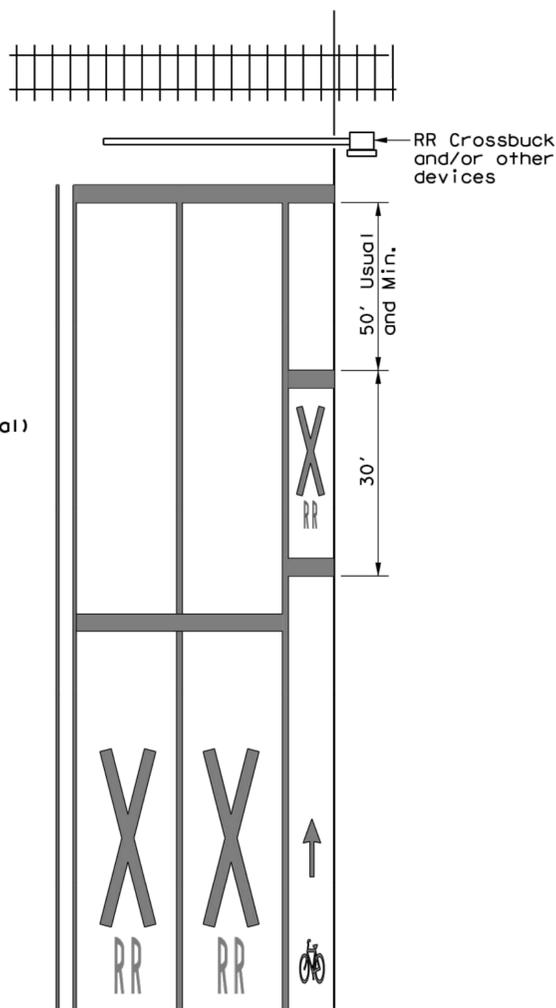
TWO-WAY STREET

GENERAL NOTES

- All bicycle lane pavement markings shall be white unless otherwise noted.
- All pavement marking materials shall meet the required Department Material Specifications as specified by the plans.
- Exact sign placement and details are shown elsewhere in the plans.
- The current edition of AASHTO'S Guide for the Development of Bicycle Facilities should be referenced for variations in design, other geometric conditions, and lane width options.
- Other bicycle lane symbol or word markings as shown in the Texas Manual on Uniform Traffic Control Devices may be used. Details for words, arrows and symbols as shown in the Standard Highway Sign Designs for Texas.
- The "BIKE LANE" (R3-17) sign with the "AHEAD" (R3-17a) sign mounted directly below should be installed in advance of the beginning of a marked bike lane.
- The "BIKE LANE" (R3-17) sign with the "END" (R3-17b) sign mounted directly below should be installed at the end of marked bicycle lane.

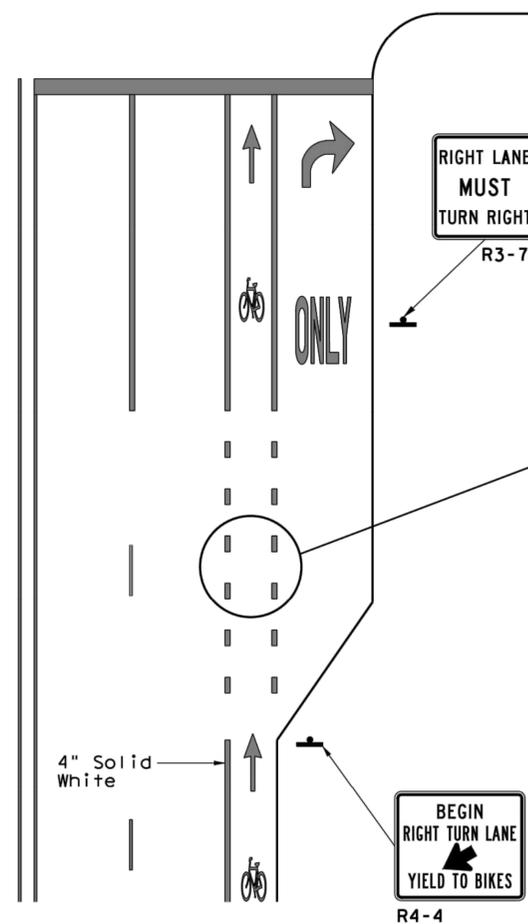
NOTE

* Dotted line not necessary at non-signalized minor intersections with no stop controls; Use solid line instead.



(See RCMP Standard for travel lane details)

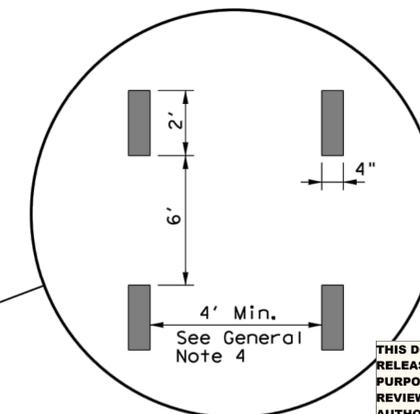
RAILROAD CROSSING APPROACH



RIGHT TURN ONLY LANE

LEGEND	
	Sign
	Traffic Flow

SPECIFICATION REFERENCE TABLE	
Traffic Paint	DMS-8200
Hot Applied Thermoplastic	DMS-8220
Permanent Prefabricated Pavement Markings	DMS-8240
Glass Traffic Beads	DMS-8290



DETAIL "A"

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Texas Department of Transportation
Traffic Operations Division

BICYCLE LANE PAVEMENT MARKINGS

BLPM-10

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SIGN SUPPORT DESCRIPTIVE CODES

(Descriptive Codes correspond to project estimate and quantities sheets)

SM RD SGN ASSM TY XXXXX(X)XX(X-XXXX)

Post Type

- FRP = Fiberglass Reinforced Plastic Pipe (see SMD(FRP))
- TWT = Thin-Walled Tubing (see SMD(TWT))
- 10BWG = 10 BWG Tubing (see SMD(SLIP-1) to (SLIP-3))
- S80 = Schedule 80 Pipe (see SMD(SLIP-1) to (SLIP-3))

Number of Posts (1 or 2)

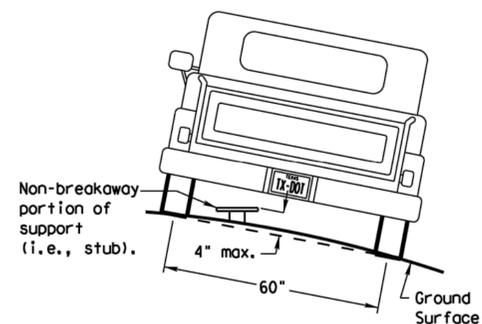
Anchor Type

- UA = Universal Anchor - Concreted (see SMD(FRP) and (TWT))
- UB = Universal Anchor - Bolted down (see SMD(FRP) and (TWT))
- WS = Wedge Anchor Steel - (see SMD(TWT))
- WP = Wedge Anchor Plastic (see SMD(TWT))
- SA = Slipbase - Concreted (see SMD(SLIP-1) to (SLIP-3))
- SB = Slipbase - Bolted Down (see SMD(SLIP-1) to (SLIP-3))

Sign Mounting Designation

- P = Prefab. "Plain" (see SMD(SLIP-1) to (SLIP-3), (TWT), (FRP))
- T = Prefab. "T" (see SMD(SLIP-1) to (SLIP-3), (TWT))
- U = Prefab. "U" (see SMD(SLIP-1) to (SLIP-3))
- IF REQUIRED
- 1EXT or 2EXT = Number of Extensions (see SMD(SLIP-1) to (SLIP-3), (TWT))
- BM = Extruded Wind Beam (see SMD(SLIP-1) to (SLIP-3))
- WC = 1.12 #/ft Wing Channel (see SMD(SLIP-1) to (SLIP-3))
- EXAL = Extruded Aluminum Sign Panels (see SMD(SLIP-3))

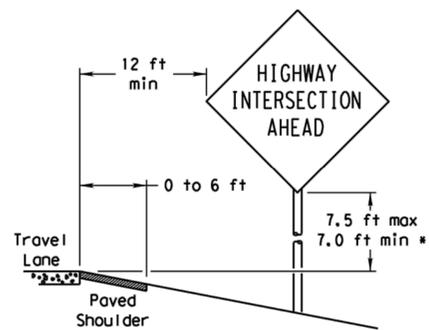
REQUIRED CLEARANCE FOR BREAKAWAY SUPPORT



To avoid vehicle undercarriage snagging, any substantial remains of a breakaway support, when it is broken away, should not project more than 4 inches above a 60-inch chord (i.e., typical space between wheel paths).

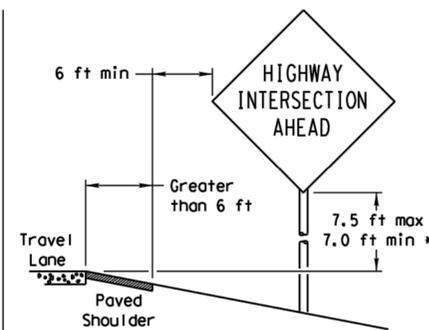
SIGN LOCATION

PAVED SHOULDERS



LESS THAN 6 FT. WIDE

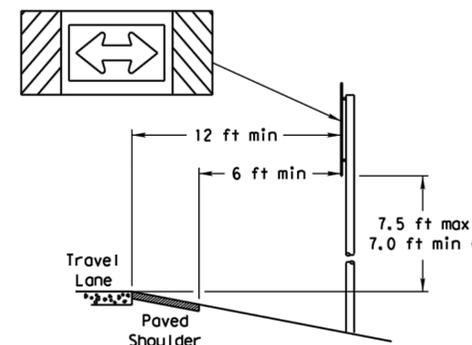
When the shoulder is 6 ft. or less in width, the sign must be placed at least 12 ft. from the edge of the travel lane.



GREATER THAN 6 FT. WIDE

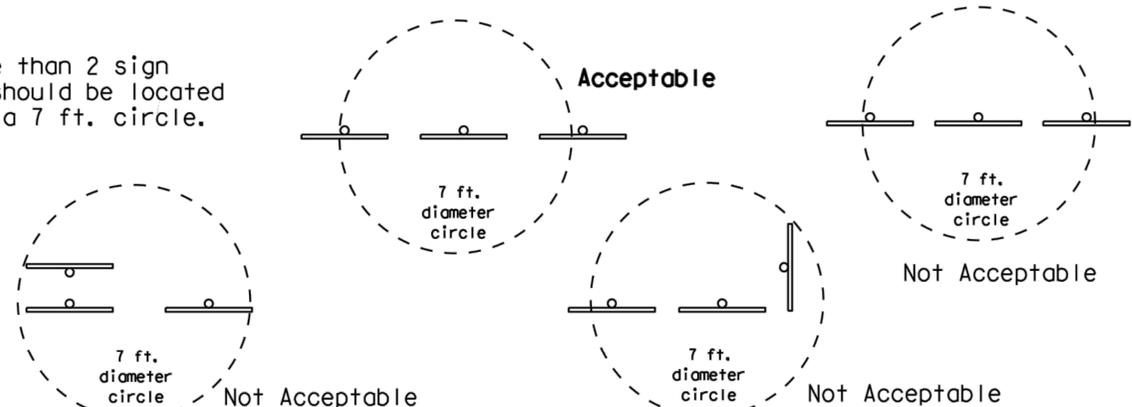
When the shoulder is greater than 6 ft in width, the sign must be placed at least 6 ft. from the edge of the shoulder.

T-INTERSECTION

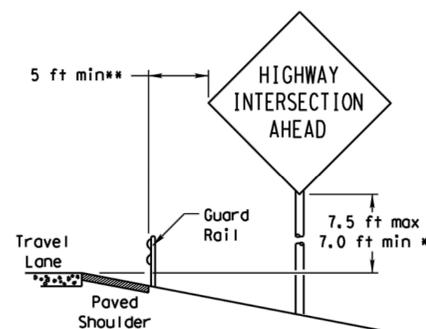


When this sign is needed at the end of a two-lane, two way roadway, the right edge of the sign should be in line with the centerline of the roadway. Place as close to ROW as practical.

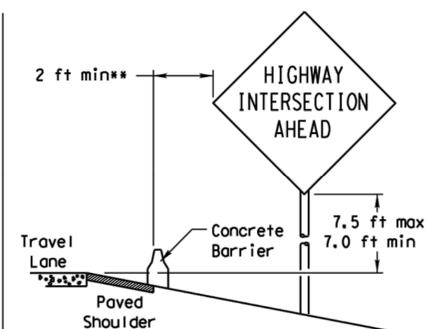
No more than 2 sign posts should be located within a 7 ft. circle.



BEHIND BARRIER



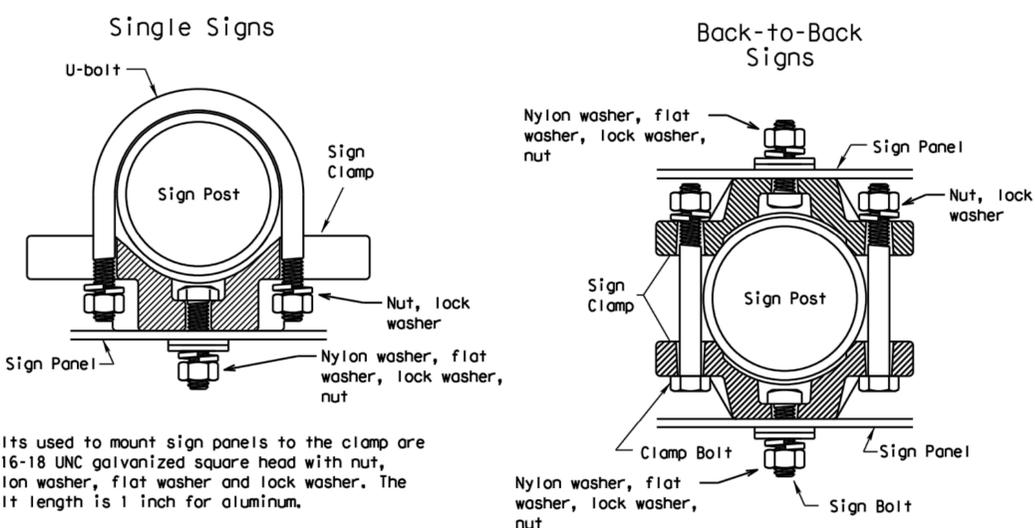
BEHIND GUARDRAIL



BEHIND CONCRETE BARRIER

**Sign clearance based on distance required for proper guard rail or concrete barrier performance.

TYPICAL SIGN ATTACHMENT DETAIL



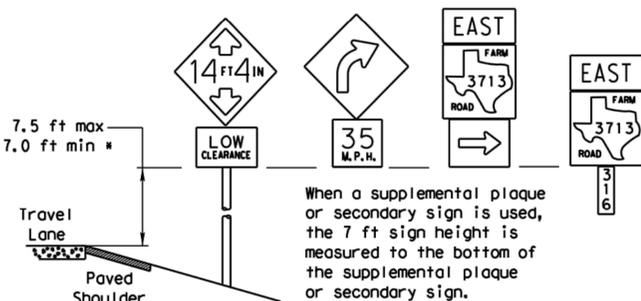
Bolts used to mount sign panels to the clamp are 5/16-18 UNC galvanized square head with nut, nylon washer, flat washer and lock washer. The bolt length is 1 inch for aluminum.

When two sign clamps are used to mount signs back-to-back, use a 5/16-18 UNC galvanized hex head per ASTM A307 with nut and helical-spring lock washer. The approximate bolt lengths for various post sizes and sign clamp types are given in the table at right. The bolt length may need to be adjusted depending upon field conditions.

Sign clamps may be either the specific size clamp or the universal clamp.

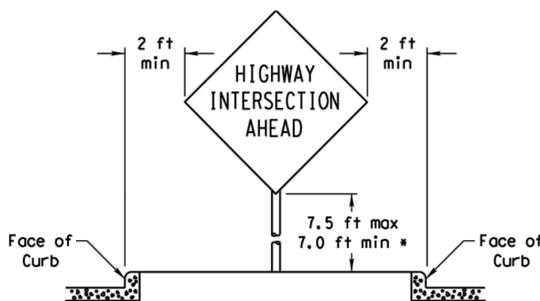
Pipe Diameter	Approximate Bolt Length	
	Specific Clamp	Universal Clamp
2" nominal	3"	3 or 3 1/2"
2 1/2" nominal	3 or 3 1/2"	3 1/2 or 4"
3" nominal	3 1/2 or 4"	4 1/2"

SIGNS WITH PLAQUES

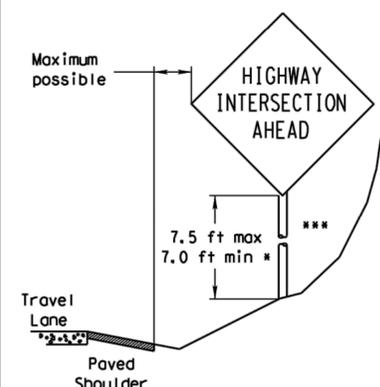


When a supplemental plaque or secondary sign is used, the 7 ft sign height is measured to the bottom of the supplemental plaque or secondary sign.

CURB & GUTTER OR RAISED ISLAND



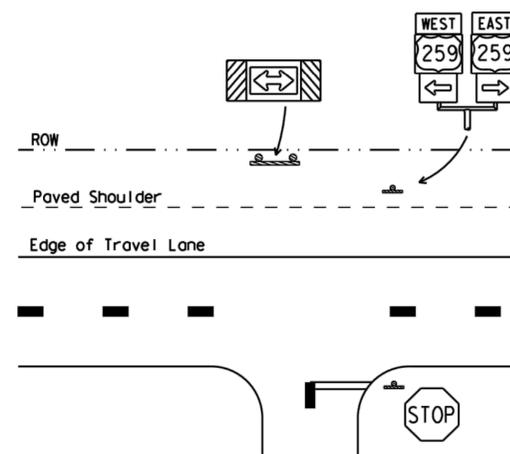
RESTRICTED RIGHT-OF-WAY (When 6 ft min. is not possible.)



Right-of-way restrictions may be created by rocks, water, vegetation, forest, buildings, a narrow island, or other factors.

In situations where a lateral restriction prevents the minimum horizontal clearance from the edge of the travel lane, signs should be placed as far from the travel lane as practical.

*** Post may be shorter if protected by guardrail or if Engineer determines the post could not be hit due to extreme slope.



* Signs shall be mounted using the following condition that results in the greatest sign elevation:

- (1) a minimum of 7 to a maximum of 7.5 feet above the edge of the travel lane or
- (2) a minimum of 7 to a maximum of 7.5 feet above the grade at the base of the support when sign is installed on the backslope.

The maximum values may be increased when directed by the Engineer.

See the Traffic Operations Division website for the purpose of interim review under the authority of John C. Ringle, P.E.

The website address is: <http://www.txdot.gov/publications/traffic>

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Texas Department of Transportation
Traffic Operations Division

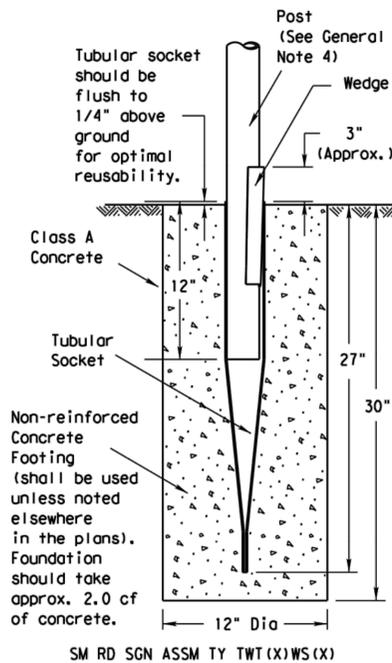
SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS GENERAL NOTES & DETAILS

SMD(GEN)-08

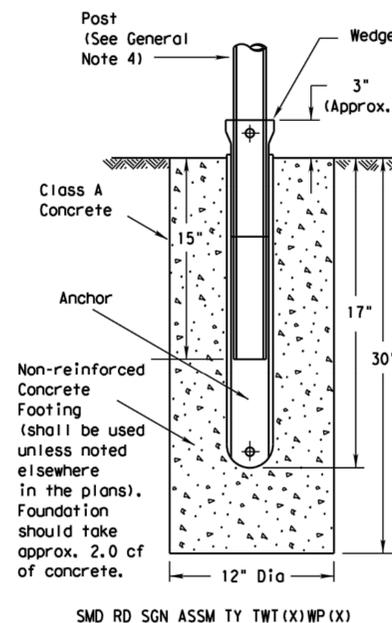
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9-08	REVISONS	CONT	SECT	JOB
				HIGHWAY
				SHEET NO.

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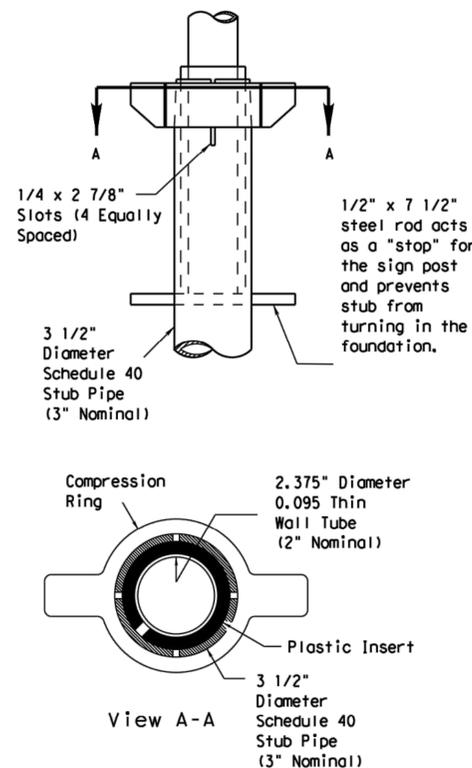
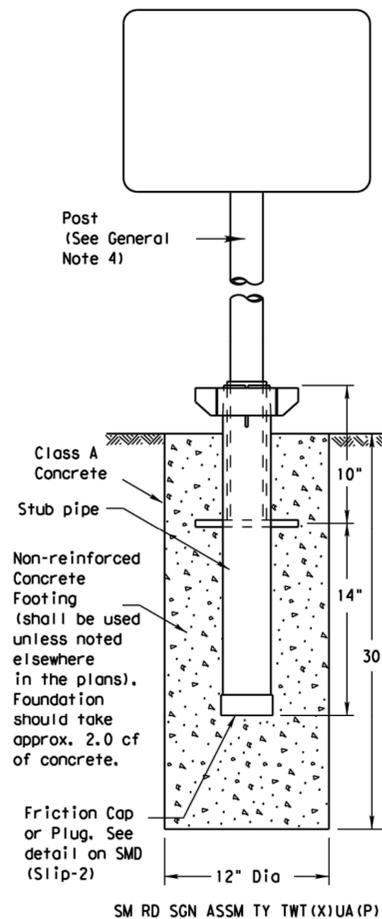
Wedge Anchor Steel System



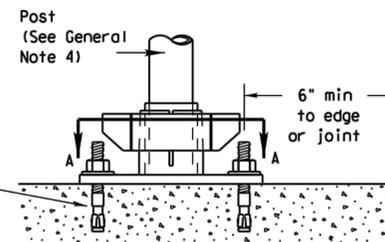
Wedge Anchor High Density Polyethylene (HDPE) System



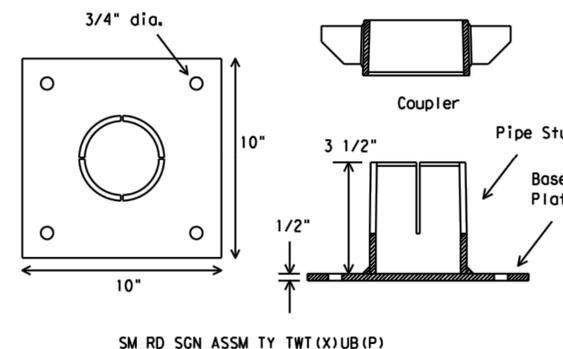
Universal Anchor System with Thin-Walled Tubing Post



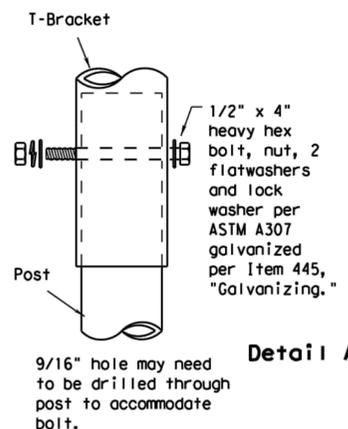
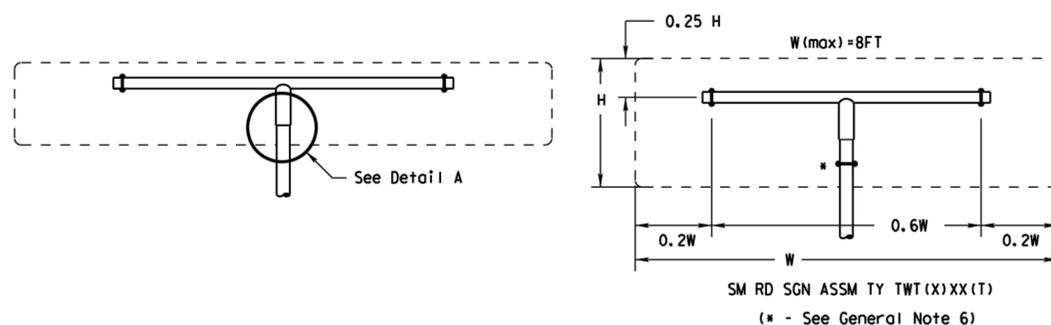
5/8" diameter Concrete Anchor - 4 places (embed a min. of 3 3/8" and torque to min. of 50 ft-lbs). Anchor may be expansion or adhesive type.



Concrete anchor consists of 5/8" diameter stud bolt with UNC series bolt threads on the upper end. A heavy hex nut per ASTM A563 and hardened washer per ASTM F436. The stud bolt shall have minimum yield and ultimate tensile strengths of 50 and 75 ksi, respectively. Nuts, bolts and washers shall be galvanized per Item 445, "Galvanizing." Top of bolt shall extend at least flush with top of nut when installed. The anchor, when installed in 4000 psi normal-weight concrete with a 3 3/8" minimum embedment, shall have a minimum allowable tension and shear of 2450 and 1525 psi, respectively. Adhesive type anchors shall have stud bolts installed with Type III epoxy per DMS-6100, "Epoxyes and Adhesives." Adhesive anchors may be loaded after adequate epoxy cure time per the manufacturer's recommendations.



Sign Installation Using a Prefabricated T-Bracket for Thin-Wall Tubing Post



NOTE

The devices shall be installed per manufacturer's recommendations. Installation procedures shall be provided to the Engineer by Contractor.

GENERAL NOTES:

- The Wedge Anchor System and the Universal Anchor System with thin wall tubing post may be used to support up to 10 square feet of sign area.
- The tubular socket, wedge and prefabricated T-bracket shall be permanently marked to indicate manufacturer. Method, design, and location of marking are subject to the approval of the TxDOT Traffic Standards Engineer.
- Except for posts (13 BWG Tubing), clamps, nuts and bolts, all components shall be prequalified. A list of prequalified vendors may be obtained from the Material Producer List web page. The website address is: http://www.txdot.gov/business/producer_list.htm
- Material used as post with this system shall conform to the following specifications:
13 BWG Tubing (2.375" outside diameter) (TWT)
0.095" nominal wall thickness
Seamless or electric-resistance welded steel tubing
Steel shall be HSLA Gr 55 per ASTM A1011 or ASTM A1008
Other steels may be used if they meet the following:
55,000 PSI minimum yield strength
70,000 PSI minimum tensile strength
18% minimum elongation in 2"
Wall thickness (uncoated) shall be within the range of .083" to .099"
Outside diameter (uncoated) shall be within the range of 2.369" to 2.381"
Galvanization per ASTM 123 or ASTM A653 G210. For pre-coated steel tubing (ASTM A653), recoat tube outside diameter weld seam by metallizing with zinc wire per ASTM B833.
- Sign blanks shall be the sizes and shapes shown on the plans.
- Additional sign clamp required on the "T-bracket" post for 24" high signs. Place clamp at least 3" above bottom of sign when possible.
- Sign supports shall not be spliced except where shown. Sign support posts shall not be spliced.
- See the Traffic Operations Division website for detailed drawings of sign clamps and Wedge Anchor System components. The website address is: <http://www.txdot.gov/publications/traffic.htm>

WEDGE ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- The Engineer may permit batches of concrete less than 2 cubic yards to be mixed with a portable, motor driven concrete mixer. For small placements less than 0.5 cubic yards, hand mixing in a suitable container may be allowed by Engineer. Place concrete into hole until it is approximately flush with the ground. Concrete shall be Class A.
- Insert tubular socket into concrete until top of socket is approximately 1/4" above the concrete footing.
- Plumb the socket. Allow a minimum 4 days for concrete to set, unless otherwise directed by Engineer.
- Attach the sign to the sign post.
- Insert the sign post into socket and align sign face with roadway.
- Drive the wedge into the socket to secure post. This will leave approximately 3 inches of the wedge exposed.

UNIVERSAL ANCHOR SYSTEM INSTALLATION PROCEDURE

- Dig foundation hole. Where solid rock is encountered at ground level, the foundation shall be a minimum depth of 18". When solid rock is encountered below ground level, the foundation shall extend in the solid rock a minimum depth of 18" or provide a minimum foundation depth of 30". If solid rock is encountered, the socket/stub may be reduced in length as required to a minimum length of 18". Any material removed from the socket/stub shall be from the bottom and the clearance requirements given on SMD(GEN) must be followed. The inner surfaces of the socket/stub must remain free of concrete or other debris.
- Insert base post in hole to depths shown and backfill hole with concrete.
- Level and plumb the base post using a torpedo level and allow concrete to set. The bottom of the slots provided in the stub pipe shall be above the top of the concrete foundation.
- Attach the sign to the sign post.
- Install plastic insert around bottom of post.
- Insert sign post into base post. Lower until the post comes to rest.
- Seat compression ring using a hammer. Typically, the top of compression ring will be approximately level with top of stub post when optimally installed.
- Check sign post by hand to ensure it is unable to turn. If loose, tighten the compression ring.

Texas Department of Transportation
Traffic Operations Division

SIGN MOUNTING DETAILS SMALL ROADSIDE SIGNS WEDGE & UNIVERSAL ANCHOR WITH THIN WALL TUBING POST SMD(TWT) - 08

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I. STORMWATER POLLUTION PREVENTION-CLEAN WATER ACT SECTION 402

TPDES TXR 150000: Stormwater Discharge Permit or Construction General Permit required for projects with 1 or more acres disturbed soil. Projects with any disturbed soil must protect for erosion and sedimentation in accordance with Item 506.

List MS4 Operator(s) that may receive discharges from this project. They may need to be notified prior to construction activities.

- 1.
2. No Action Required Required Action

Action No.

1. Prevent stormwater pollution by controlling erosion and sedimentation in accordance with TPDES Permit TXR 150000
2. Comply with the SW3P and revise when necessary to control pollution or required by the Engineer.
3. Post Construction Site Notice (CSN) with SW3P information on or near the site, accessible to the public and TCEQ, EPA or other inspectors.
4. When Contractor project specific locations (PSL's) increase disturbed soil area to 5 acres or more, submit NOI to TCEQ and the Engineer.

II. WORK IN OR NEAR STREAMS, WATERBODIES AND WETLANDS CLEAN WATER ACT SECTIONS 401 AND 404

USACE Permit required for filling, dredging, excavating or other work in any water bodies, rivers, creeks, streams, wetlands or wet areas.

The Contractor must adhere to all of the terms and conditions associated with the following permit(s):

- No Permit Required
- Nationwide Permit 14 - PCN not Required (less than 1/10th acre waters or wetlands affected)
- Nationwide Permit 14 - PCN Required (1/10 to <1/2 acre, 1/3 in tidal waters)
- Individual 404 Permit Required
- Other Nationwide Permit Required: NWP# _____

Required Actions: List waters of the US permit applies to, location in project and check Best Management Practices planned to control erosion, sedimentation and post-project TSS.

- 1.
- 2.
- 3.
- 4.

The elevation of the ordinary high water marks of any areas requiring work to be performed in the waters of the US requiring the use of a nationwide permit can be found on the Bridge Layouts.

Best Management Practices:

Erosion	Sedimentation	Post-Construction TSS
<input type="checkbox"/> Temporary Vegetation	<input type="checkbox"/> Silt Fence	<input type="checkbox"/> Vegetative Filter Strips
<input type="checkbox"/> Blankets/Matting	<input type="checkbox"/> Rock Berm	<input type="checkbox"/> Retention/Irrigation Systems
<input type="checkbox"/> Mulch	<input type="checkbox"/> Triangular Filter Dike	<input type="checkbox"/> Extended Detention Basin
<input type="checkbox"/> Sodding	<input type="checkbox"/> Sand Bag Berm	<input type="checkbox"/> Constructed Wetlands
<input type="checkbox"/> Interceptor Swale	<input type="checkbox"/> Straw Bale Dike	<input type="checkbox"/> Wet Basin
<input type="checkbox"/> Diversion Dike	<input type="checkbox"/> Brush Berms	<input type="checkbox"/> Erosion Control Compost
<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Erosion Control Compost	<input type="checkbox"/> Mulch Filter Berm and Socks
<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Mulch Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks
<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Compost Filter Berm and Socks	<input type="checkbox"/> Vegetation Lined Ditches
	<input type="checkbox"/> Stone Outlet Sediment Traps	<input type="checkbox"/> Sand Filter Systems
	<input type="checkbox"/> Sediment Basins	<input type="checkbox"/> Grassy Swales

III. CULTURAL RESOURCES

Refer to TxDOT Standard Specifications in the event historical issues or archeological artifacts are found during construction. Upon discovery of archeological artifacts (bones, burnt rock, flint, pottery, etc.) cease work in the immediate area and contact the Engineer immediately.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

IV. VEGETATION RESOURCES

Preserve native vegetation to the extent practical. Contractor must adhere to Construction Specification Requirements Specs 162, 164, 192, 193, 506, 730, 751, 752 in order to comply with requirements for invasive species, beneficial landscaping, and tree/brush removal commitments.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

V. FEDERAL LISTED, PROPOSED THREATENED, ENDANGERED SPECIES, CRITICAL HABITAT, STATE LISTED SPECIES, CANDIDATE SPECIES AND MIGRATORY BIRDS.

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.
- 4.

If any of the listed species are observed, cease work in the immediate area, do not disturb species or habitat and contact the Engineer immediately. The work may not remove active nests from bridges and other structures during nesting season of the birds associated with the nests. If caves or sinkholes are discovered, cease work in the immediate area, and contact the Engineer immediately.

LIST OF ABBREVIATIONS

BMP: Best Management Practice	SPCC: Spill Prevention Control and Countermeasure
CGP: Construction General Permit	SW3P: Storm Water Pollution Prevention Plan
DSHS: Texas Department of State Health Services	PCN: Pre-Construction Notification
FHWA: Federal Highway Administration	PSL: Project Specific Location
MOA: Memorandum of Agreement	TCEQ: Texas Commission on Environmental Quality
MOU: Memorandum of Understanding	TPDES: Texas Pollutant Discharge Elimination System
MS4: Municipal Separate Stormwater Sewer System	TPWD: Texas Parks and Wildlife Department
MBTA: Migratory Bird Treaty Act	TxDOT: Texas Department of Transportation
NOT: Notice of Termination	T&E: Threatened and Endangered Species
NWP: Nationwide Permit	USACE: U.S. Army Corps of Engineers
NOI: Notice of Intent	USFWS: U.S. Fish and Wildlife Service

VI. HAZARDOUS MATERIALS OR CONTAMINATION ISSUES

General (applies to all projects):

Comply with the Hazard Communication Act (the Act) for personnel who will be working with hazardous materials by conducting safety meetings prior to beginning construction and making workers aware of potential hazards in the workplace. Ensure that all workers are provided with personal protective equipment appropriate for any hazardous materials used.

Obtain and keep on-site Material Safety Data Sheets (MSDS) for all hazardous products used on the project, which may include, but are not limited to the following categories: Paints, acids, solvents, asphalt products, chemical additives, fuels and concrete curing compounds or additives. Provide protected storage, off bare ground and covered, for products which may be hazardous. Maintain product labelling as required by the Act.

Maintain an adequate supply of on-site spill response materials, as indicated in the MSDS. In the event of a spill, take actions to mitigate the spill as indicated in the MSDS, in accordance with safe work practices, and contact the District Spill Coordinator immediately. The Contractor shall be responsible for the proper containment and cleanup of all product spills.

Contact the Engineer if any of the following are detected:

- * Dead or distressed vegetation (not identified as normal)
- * Trash piles, drums, canister, barrels, etc.
- * Undesirable smells or odors
- * Evidence of leaching or seepage of substances

Does the project involve any bridge class structure rehabilitation or replacements (bridge class structures not including box culverts)?

- Yes No

If "No", then no further action is required.

If "Yes", then TxDOT is responsible for completing asbestos assessment/inspection.

Are the results of the asbestos inspection positive (is asbestos present)?

- Yes No

If "Yes", then TxDOT must retain a DSHS licensed asbestos consultant to assist with the notification, develop abatement/mitigation procedures, and perform management activities as necessary. The notification form to DSHS must be postmarked at least 15 working days prior to scheduled demolition.

If "No", then TxDOT is still required to notify DSHS 15 working days prior to any scheduled demolition.

In either case, the Contractor is responsible for providing the date(s) for abatement activities and/or demolition with careful coordination between the Engineer and asbestos consultant in order to minimize construction delays and subsequent claims.

Any other evidence indicating possible hazardous materials or contamination discovered on site. Hazardous Materials or Contamination Issues Specific to this Project:

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.

VII. OTHER ENVIRONMENTAL ISSUES

(includes regional issues such as Edwards Aquifer District, etc.)

- No Action Required Required Action

Action No.

- 1.
- 2.
- 3.

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Design Division Standard

ENVIRONMENTAL PERMITS, ISSUES AND COMMITMENTS

EPIC

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©TxDOT: February 2015	CONT	SECT	JOB	HIGHWAY
12-12-2011 (DS) REVISIONS				
05-07-14 ADDED NOTE SECTION IV.				
01-23-2015 SECTION I (CHANGED ITEM 1122 TO ITEM 506, ADDED GRASSY SWALES.	DIST	COUNTY		SHEET NO.

DATE: FILE:

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